SCIENTIFIC AMERICAN

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GLASS MAKING AT THE CENTENNIAL EXPOSITION.

There is no portion of the Centennial Exposition more generally interesting, or which at all times attracts greater crowds of people, than the glass factory. This is located in a separate building, in rear of the huge shed wherein are exhibited the steam sawing machines, and there, for the first time in the history of any world's fair, the visitor may witness the entire glass-making process. Two weeks before the Exposition opened its gates to the public, the fires under the great cluster of pots were lighted, and since then, some seven tuns of materials have weekly been melted and converted into tumblers, and goblets, and vases, and the hundreds of minor articles designed as *souvenirs* of the Centennial.

The operation of glass making begins with charging the pots, which are huge crucibles of clay arranged around the central fire of a huge furnace, the lofty stack of which, always pouring forth smoke, is a prominent object in any distant view of the grounds. In these pots the raw materials, sand, pearlash, lead, soda ash, lime, nitrate of soda, various oxides, etc., are placed, previously being thoroughly ground and mingled with broken glass. Each pot holds about 1,600 lbs. of ingredients, and but half of the total number of pots are worked at a time. A part of the charge is first inserted; then as this melts more is added, and thus the receptacles become gradually filled with melted "metal." The fire is now urged, and the workmen constantly thrust their long iron bars into the viscid dazzling mass, withdraw a huge drop or two at a time, and examine it, until at last the bubbles, which at first are thickly scattered through it, become fewer and fewer; the scum which forms on the surface is ladled off, the heat is carried to the highest degree

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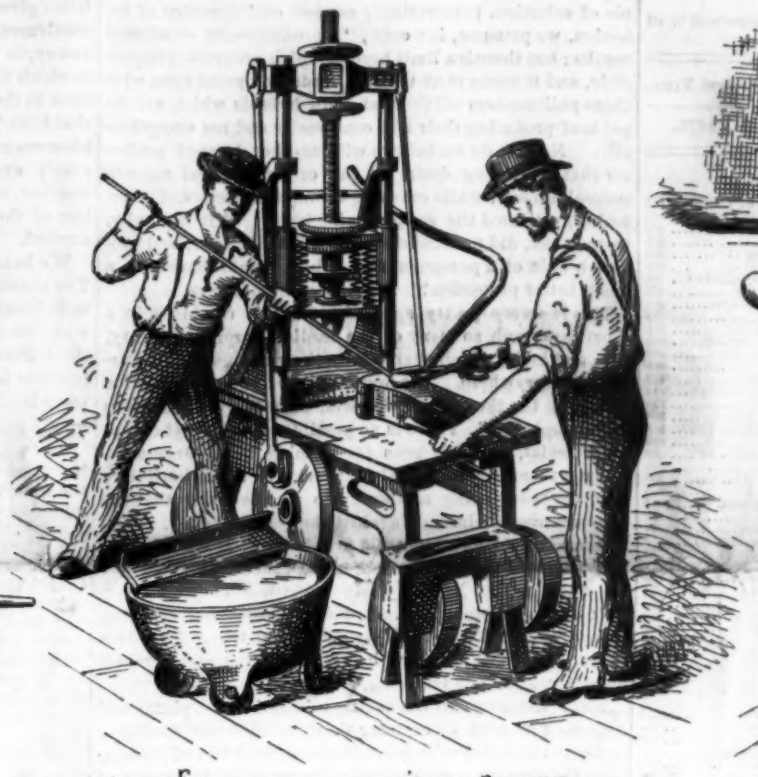
THE GOBLET MOULD.



FILLING THE MOULD BEFORE PRESSING.

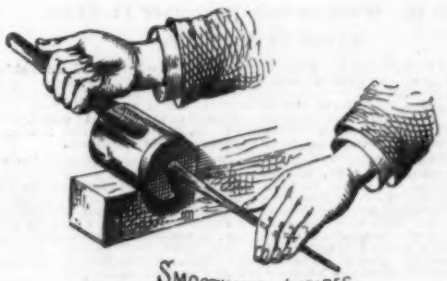
TAKING MOLTEN GLASS FROM THE POT.

BLOWING GLASS.

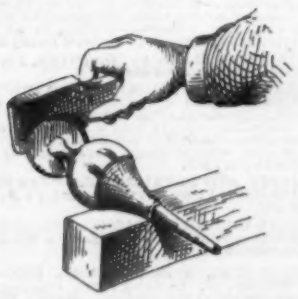
ANNEALING FURNACE.

TOOL

GLORY HOLE



SMOOTHING INSIDES.



MAKING BOTTOMS.

GLASS MAKING AT THE CENTENNIAL EXHIBITION.

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Contents.

(Illustrated articles are marked with an asterisk.)

THE SCIENTIFIC AMERICAN SUPPLEMENT.

Vol. II., No. 46.

For the Week ending November 11, 1876.

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ULTRA-DARWINISM.

The story is told of a tourist among the mountains of Wales who, amazed at the contrast between the thought and the language of a village preacher's sermon, asked an explanation of the marvel. The honest preacher confessed that, in default of ability to write an original sermon, he made a practice of translating the sermons of a leading English divine, first into Welsh and then into the dialect of his hearers: by which time, he naively remarked, "the author himself wouldn't recognize them."

Sometimes we think there must be some such process of translation continually going on with regard to scientific discoveries, a translation into a dialect as unscientific as the Welsh preacher's was un-English; and what is worse, the the would-be scientific teachers usually manage to impart a greater confusion into the thought than the Welshman did into the language.

Anything about Darwinism, for example, in almost any religious newspaper will serve as an illustration of this process and its results. But the mischief is unhappily not confined to the religious press, so-called. It turns up in all sorts of places. One of the prettiest specimens we have seen lately appears in the last report of the Secretary of the Massachusetts Board of Agriculture. The chairman of the committee on poultry, discussing new breeds and how to produce them, gravely remarks:

"We are not of the number of those who believe in the ingenious but improbable theories of Darwin. The principle of selection, perseveringly carried out" (practice of selection, we presume, is meant), "is productive of wonderful results; but there is a limit beyond which progress is impossible, and it seems to us that the burden of proof rests with these philosophers till they can show hybrids which are capable of producing their like continually and not exceptionally. Neither do we believe with another learned professor that the strong desire of the original Bengal tiger to conceal himself, while crawling through thickets and canebrakes, produced the stripes on his body. If it did, why, we may ask, did not that desire go a little further, and produce a skin of a *pea-green tint*, which would have been a much better protection?" The italics are not ours.

This is a very pretty specimen, since it combines in a short paragraph so many of the leading errors of theory, fact, and logic, which characterize the writings of anti-Darwinists everywhere. The first stroke is to beg the question by calling the theories of Darwin, in a lump, "ingenious but improbable." There is no possible reply to that except a flat denial, and that goes for nothing in an argument. The next stroke is an appeal to "fact," in an authoritative way, very convincing to those who do not know that the facts are overwhelmingly against the position taken.

Our poultry man's logic was in this wise: If specific evolution by variation is true, then crosses between related species ought not to be invariably infertile. They are infertile: in other words, are incapable of producing offspring able to breed with each other and breed true. Therefore evolution is false, and the theory of distinct and separate specific creations is true.

But it happens that the asserted infertility of plants and animals produced by crossing those of different species is not true: and in producing this as a crucial test of Darwinism, the objector only confesses his profound ignorance of Nature. Among plants, fruitful bastards are plentiful; so they are among insects, fish, and birds. And they are not uncommon among the higher animals.

For example, systematists have never questioned the specific distinctness of the hare (*lepus timidus*) and the rabbit (*lepus cuniculus*); yet for a quarter of a century a cross of these two species has been bred for the table in France. In their natural state, the two species will not pair, but when bred together from birth there is no aversion; they pair freely, and produce offspring which are neither hares nor rabbits, but a clearly marked hybrid species, capable of propagating itself by pure in-and in-breeding. But this is not nearly so remarkable as the cross of goats and sheep—two distinct genera—bred for industrial purposes in Chili. In this case it happens that only the offspring of the he-goat with the ewe are fertile, the ram and the she-goat pairing but rarely, and then without result.

But we have wandered a long way from our typical anti-evolutionist. The faults we have pointed out are followed in the same short paragraph by two others, equally characteristic and possibly more common among that sort of writers; the first is misrepresentation, the second, erroneous inference from incorrectly apprehended facts.

If he ever existed, the "learned professor," who accounted for the tiger's stripes by the strong desire of that animal to hide himself in cane-brakes, has been dead a great many years: so many that Darwin and his friends may fairly be reckoned innocent of any responsibility for his intellectual vagaries. Only pretentious ignorance could seriously refer to such an ultra-Lamarckian view in connection with modern Science: but our poultry man evidently thinks the hypothetical learned professor a model Darwinist, and the example given a true illustration of the accepted method of evolution. It is a characteristic blunder of the school of thinking and writing which he so happily represents.

But the most charming exhibition of scientific and logical verdancy—pea-green tintedness, one might say—also characteristic of the school, appears in the closing question. It is triumphantly funny. Just think what a conspicuous object a pea-green tiger would be in the customary haunts of tigers!

Whether he got his color by desiring it, or by the natural process of variation, with the survival of the fittest, a pea-green tiger would be equally an impossibility; while for protection amid thickets of vertical stems, white and brown, and casting the blackest of shadows in the glow of a tropical sun, no other coloring of his coat would serve nearly as well as the one he now enjoys. Tiger hunters declare that a motionless tiger is all but invisible amid jungle growths, even when his form is fully exposed.

At this late day it would seem impossible for an intelligent man—much more a man who aspires to be a teacher in any department of nature-study, even poultry breeding—to cram so many typical blunders unwittingly into one short paragraph; but there they are, and we suppose that men will go on doing the like just as long as it remains more fashionable and "orthodox" to denounce Darwin than to read him, so much easier to settle questions of scientific theory off-hand than to examine them by the light of sound experience and verifiable observation.

WAS IT VULCAN?

In our recent article on the intra-Mercurial planet, we published a communication in which a correspondent reported his having witnessed the transit of a dark body across the sun's disk on July 23, 1876, at about 3 P. M. The instrument used, a 2½ inch telescope, defined the object as a clearly cut circle, not jagged nor presenting the well known characteristics of a solar spot. Observations made a few days after revealed no trace of the phenomenon.

Our correspondent's observation is now confirmed by the letter given below. The writer, Mr. Samuel Wilde, is a gentleman of wealth, owning a private astronomical observatory, in which is located the 6¼ inch refracting telescope to which he alludes. This instrument is the largest of its class in the State of New Jersey. It will be noted further that both Mr. Wilde and our correspondent B. B. saw the phenomenon from the same locality, Montclair, N. J., at nearly exactly the same time; so that, the conditions of weather, etc., being precisely similar, the mutual confirmation of these two independent observations is all the more marked.

We hazard no opinion as to the nature of the occurrence. The circumstances, on one hand, are in every way opposed to its being a sun spot, while on the other they certainly tally with the descriptions given by Lescarbault and others of their observations of a supposed Vulcanian transit. The problem is one for the astronomers to solve, and to them we leave it. Meanwhile, here is Mr. Wilde's letter:

To the Editor of the Scientific American:

Accidentally hearing of the article in your paper of October 21 on the subject of the intra-Mercurial planet and of the observation by your correspondent (B. B.), it brought to my mind an observation of the sun I had on the same day, Sunday, the 23d of July last. Having some friends visiting at my house, they desired to see the spots on the sun. Knowing that none had been visible for some time, and the day being exceedingly warm and my observatory some little way off, they concluded to stay in the house until I ascertained if any were visible. At about one quarter to three o'clock I directed my telescope (a 6¼ inch) toward the sun's disk, and immediately perceived a well defined dark round spot on the lower left portion of the sun, substantially as given in B. B.'s drawing. I watched it 25 or 30 minutes, when, the sun becoming obscured by a passing cloud, I returned to the house. Knowing that the spot was of unusual character, entirely different from any sun spot I had ever seen before, I remarked to my friends that none of the usual spots were visible, but that I had observed a dark round spot, apparently moving, which looked like the photograph of the transit of Venus. Not knowing of the expected appearance of Vulcan, I took no note of its motion; and the occurrence had passed from my mind until my attention was called to the article in your paper. I used the solar prism, thus having a white light.

SAMUEL WILDE.

Montclair, N. J., October 24, 1876.

The French scientific periodicals which have arrived since the above was written are filled with discussions and news relative to the supposed planet. M. Leverrier has reviewed his calculations, and now rejects all previous observations but five, three of which occurred in the month of March in the years 1849–56, and 1859, and two in October of 1802 and 1839. Combining these, he calculates an orbit with greater precision than heretofore, determining the positions of the imaginary planet within half a degree. The result is that he now announces the Vulcanian year as neither 42 nor 28 days, but as 33·0225 days.

Next comes Señor Ventosa, Astronomer of the Madrid Observatory, who proceeds to annihilate Weber's observation, on which all the present excitement is founded. On April 3, at 23h. 18m. Berlin time, Señor Ventosa saw a sun spot and noted its position. On April 4, at 4h. 25m. same time, M. Weber saw his supposed Vulcan, and noted its locality on the sun's face. Calculating back from Weber's position, for a period of 5 hours and 7 minutes, brings Weber's planet in exactly the place where Ventosa saw the spot. *Ergo*, Weber saw a sun spot; and as M. Leverrier himself accepts this conclusion, there is an end of Weber's fragile foundation. But this need not arrest the work of astronomers who are still watching the solar face. There are the two observations of our correspondents which yet remain, and which are certainly much more valuable and better authenticated than that of M. Weber.

M. Janssen, the distinguished physical astronomer, ha, sent to the French Academy of Sciences the following notes which offers excellent suggestions to observers. The roundness of an observed body, he says, on the sun's face is not a specific characteristic of an intra-Mercurial planet, neither does its disappearance after five or six hours incontestably prove a planetary transit. There exist, however, features determined from the constitution of the photosphere which allow, even during the brief instants of a fugitive observation, of deciding whether the phenomenon seen is

solar or extra-solar. The sun's surface is covered with granulations, which are called various names, but which are perfectly familiar to any practised observer. These become modified near the sun spots, and the latter (independently of the penumbra, which rarely is absent, especially about round spots) are surrounded with circular faculæ which almost invariably throw out appendages. A body in motion, interposed between the eye and the solar surface, should produce a succession of eclipses of the granulations, covering those toward which it progresses, and uncovering others behind it. This phenomenon of emersion and immersion is the most decisive test during a rapid observation. It requires, it is true, a good instrument of ample enlarging power; but observations made with small instruments are in any case doubtful, as they cannot include all the true characteristics of the phenomenon.

Photography nowadays gives us such perfect solar images that it may best be used in work requiring great precision. The photograph of a transit, if made with a proper instrument, carries with it the stamp of authenticity, and is better than the most perfect observation of the ablest astronomer. In order to search for Vulcan by photography, a succession of pictures of the sun will have to be taken so rapidly that no time, sufficient for a transit to take place, will elapse between any two. A revolving apparatus using dry plates and working automatically, so as to take a photograph once an hour, would answer all requirements best, especially as the astronomer, by using dry plates, can afterwards develope his images at his leisure, or need not concern himself with photographic manipulations at all. A certain number of such instruments, says M. Janssen, distributed systematically over the globe and kept going for a few years, would explore the solar regions so thoroughly as to settle all question as to whether an intra-Mercurial planet does or does not exist.

THE CENTENNIAL AWARDS.

Viewing its work as a whole, the Centennial Commission has done wonders, it has made the Exposition a grand success, it deserves the hearty thanks of the people, and will get them. But its action in respect to the awards will, we fear, give considerable dissatisfaction.

It was decided to make supplementary awards, and there upon a board of judges of appeal was constituted. Had this board proceeded to review cases where injustice and oversight was charged, and to issue favorable reports when the facts warranted, signed by its particular members, all would be well; but probably incited by exhibitors who would not abate their demands one jot, and who wanted just exactly as valuable a report as their competitors had received in the first instance, and nothing else, the Commission concluded to render all reports equal by erasing the names of all the judges on all the reports, and substituting therefor the signatures of Director General Goshorn and Secretary Campbell.

The action, we learn, has been taken in the face of the opposition of General Walker, the Chief of the Bureau of Awards, and of prominent members of the Commission.

THE RETURN OF THE BRITISH ARCTIC EXPEDITION.

The British arctic expedition under Captain Nares, comprising the steamers Alert and Discovery, has returned, the Alert having arrived at Valentia, Newfoundland, on October 27. The ships left England on May 30, 1875, and entered the ice off Cape Sable, on July 29. After a severe struggle, the north side of Lady Franklin Bay was reached, and here the Discovery was left in winter quarters. The Alert pushed on up to latitude 82° 27′, and there wintered. At this point the sun was invisible for 142 days, and the lowest temperature ever recorded was experienced. The mercury fell to 59° below zero, and remained so for a fortnight, and at one period reached 104° below zero. Sledge parties were fitted out, one of which traveled 220 miles to the eastward, and the other went to the north, proceeding on land up to 83° 07′, and thence on the ice to 83° 21′. Further on, nothing but ice could be seen, which was so rugged that scarcely a mile of advance could be accomplished daily. The floes in some places measured 150 feet in thickness. Four men died from the effects of the cold. Finally, becoming convinced that it was impossible to get any nearer to the pole, and seeing that his men were succumbing under the hardships, while the Alert herself had been much damaged by the ice, Captain Nares started homeward, leaving Smith Sound on September 9 last.

This expedition, it will be remembered, was fitted out with every aid to polar exploration which Science could devise or the experience of the oldest arctic explorers could suggest. That it has failed to reach the pole is proof of the enormous difficulties to be overcome in that undertaking, rather than of any inadequacy to the task of those who attempted it. Indeed, we may believe that, after latitude 82° is reached, the obstacles augment in some compound ratio. The results which have been obtained are, however, of considerable importance. Captain Nares has reached the highest northern point ever attained, latitude 83° 21′. The Austrian expedition, which sailed, in 1872, toward Spitzbergen, only reached Cape Fligely in 82° 5′, and sighted Cape Vienna in 83°. It is remarkable, however, that the Polaris, ill equipped as she was, reached 82° 16′, and wintered in 81° 38′, while Hall, with a sledging party, pushed onward to 82° 30′. Captain Nares has, therefore, advanced 51 geographical miles further north than the American explorer, and has approached within 400 miles of the pole.

The details of the other accomplishments of the expedition which have reached us are very meager, but indicate that Captain Nares' forthcoming report will be of considerable value. President Land, usually marked on arctic maps, has no existence. Lady Franklin's Strait is really a bay; and from the fact that travel was conducted on the ice to the highest point reached, it would seem that no open polar sea was encountered. The northernmost point seen in Greenland, was in latitude 82° 57°. Excellent coal was found near the place where the Discovery wintered, and a number of valuable scientific collections and observations were made.

The Pandora is still in the ice, and was met by the Alert on October 16 (where, not stated), when she signaled "all well."

THE NEW YORK AQUARIUM.

The new aquarium at the corner of Broadway and Thirty-fifth street promises to be a positive and genuine addition to the city's resources for instructive entertainment. It is a pity it could not have been placed, as first proposed, in Central Park, and made a part of the valuable zoölogical exhibition already so popular there; but as that was impossible, we are thankful that Mr. Coup has had the courage to undertake it as a private venture. Unless we greatly misjudge the interest which most intelligent people take in such things, the enterprise cannot fail to command its full meed of recognition and reward.

At present, however, the aquarium labors under serious disadvantages as an exhibition. The water in the tanks is still almost turbid with decomposing vegetable and animal matter, making it difficult to see the objects exhibited, and even more difficult to keep them alive and well; while the work of stocking has been seriously hindered by the bursting of tanks and the death of many rare and valuable fish and aquatic animals. Nearly all the first supplies, including two white whales, were lost before the tanks were in proper working order; and many objects which might otherwise have been saved were killed in consequence of the absorption by the water of poisonous vapors from the freshly painted and varnished interior of the main hall.

All these obstacles and mishaps, it is to be hoped, will soon be corrected and overcome; the water will be freed of organic matter by aeration; new objects of interest will be added, and in a little while we may expect to see an exhibition of aquatic life such as will compare favorably with those which have proved so popular and instructive abroad.

Already the collection contains representatives of many of our principal salt and fresh water fishes, with a few that are rare and curious, besides turtles, alligators, seals, a young whale, and a considerable number of the lower forms of marine life. In capacity the building compares favorably with the more important aquaria abroad: not so large as those of Manchester and Brighton, but fully equal in tankage to many of the most useful and successful. The main tank, which has a front of 65 feet, is the second in size, it is said, in the world. Here, at present, are numerous dog fish, a regular shark of considerable size, a gigantic sturgeon, several large sea turtles, and a number of skates and rays. In the center of the pavilion is a raised circular tank 30 feet in diameter, now occupied with a white whale calf from the Gulf of St. Lawrence. In front is a depressed pool of equal dimensions, where three active and clever seals have already made themselves the pets of numerous visitors. Back of the whale tank, and occupying the larger part of the western end of the pavilion, are the sea lions' pools, surrounded by an attractive rockery, and spanned by a rustic bridge from which a good view is to be had of the entire exhibition hall.

The northern side is devoted to a row of large tanks, lined with rockwork and tenanted at present with numerous representatives of our principal lake, river, and sea fish, besides crabs, lobsters, anemones, and the like. Four of these tanks present a crystal frontage of 8 feet by 10 feet each; and a dozen smaller ones have 4 by 5 feet fronts. On the southern side are twenty-five or thirty table tanks, glazed on all sides, for the exhibition of the smaller fish, crustaceans, etc.; a large tank for trout and allied species; and—one of the most valuable features of the aquarium—Mr. Mather's tank for fish hatching, now occupied in part by an interesting lot of California salmon eggs in process of development.

The arrangements for securing a constant circulation of water through the tanks, for aerating the water when it enters the tanks, and again when it is on its return course to the main reservoirs, and for hastening the oxidation of the organic matter originally in the water and constantly being added to it by its inhabitants, are ingenious and satisfactory. By these means only the loss by evaporation and leakage has to be replaced, the original supply of water being used over and over again, as in Nature, while undergoing a perpetual process of purification.

Specially to be commended are the educational features of this new enterprise, particularly those designed to assist practical students of marine life in the prosecution of their researches. As an adjunct to the aquarium, it is proposed to have a free scientific reading room, and a laboratory, provided with experimental tanks, dissecting tables, microscopes, and other appliances for the critical study of aquatic life and the anatomy of aquatic forms. This department, for which pleasant rooms have been provided over the main entrance, is under the direction of Professor W. S. Ward at whose suggestion it was established. It is proposed to admit to its privileges all such teachers and students as may desire to avail themselves of the opportunity thus offered for the practical pursuit of zoölogical studies.

The general aspect of the main pavilion, with its rustic work, and foliage is quite pleasing, and we have no doubt but that it will soon become a place of great resort. Its popularity and its profitableness as well, we think, would be increased by a large reduction of the admission fee; but that is a matter which the proprietors will have to demonstrate for themselves. It is to be feared, too, that an unfavorable impression of its value will be gained by many who visit it just now, for the collection is comparatively meager; and though containing much that is curious and interesting, it falls so far short of what one might expect from the bombastic advertisement that it is really disappointing, for the money. As a beginning, however, considering the difficulties to be overcome in starting an enterprise so largely experimental in character, it is worthy of every encouragement.

DETOXICATED TOBACCO.

A correspondent, referring to our recent article "A Cigar Scientifically Dissected," asks whether there be not some method whereby tobacco can be rendered innocuous and yet have its agreeable aroma preserved. The fact that numerous attempts in this direction have been made, and yet there is no substitute for tobacco and no de-nicotinized tobacco in general use, is in itself a sufficient answer to the question. It is the combination of poisons which we enumerated which produce the agreeable taste and smell, and to remove any of the ingredients seems simply to render the tobacco unpalatable.

Upon many persons coffee exercises a very deleterious influence; but they can, and often do, drink a chicory infusion, which tastes very like that of the Arabian berry, though totally destitute of all the aroma of coffee. Similarly it is possible that there may be some vegetable which is sufficiently near in savor to tobacco to render it valuable as a substitute or as an adulterant for the genuine leaf; and it might be well for botanists and chemists to undertake researches with a view to discovering the same. Meanwhile the most successful efforts to render tobacco less hurtful have been those involving mechanical means. The Turkish nargileh or water pipe, in which the smoke is drawn through water, is probably the least harmful method of smoking practised, a fact proved by the thick dark scum of oil which appears on the water after use. A nargileh is easily made out of a wide-mouthed bottle. The tube attached to the pipe bowl is led down beneath the surface of the water which half fills the vessel, and the smoke is withdrawn through another tube which enters the empty space above the water. Numerous pipes have been patented in which the smoke is filtered through cotton or sponge, or led into a little chamber where the oil is deposited, and thence withdrawn Attempts have been made to treat the smoke chemically during its passage through the filter. M. Ferrier soaks the cotton in a solution of tannin, and dries it in the air. The tannin, he claims, retains the nicotine in chemical combination. French chemists who have tested this plan are widely at variance. Cahours confirms Ferrier's experimental results, and says that the nicotine is wholly removed. Barral objects that nicotine is not capable of uniting with tannin, and that the latter substance is not less injurious than nicotine. We do not find many records of investigation in this branch of the subject, and researches here also might be valuable.

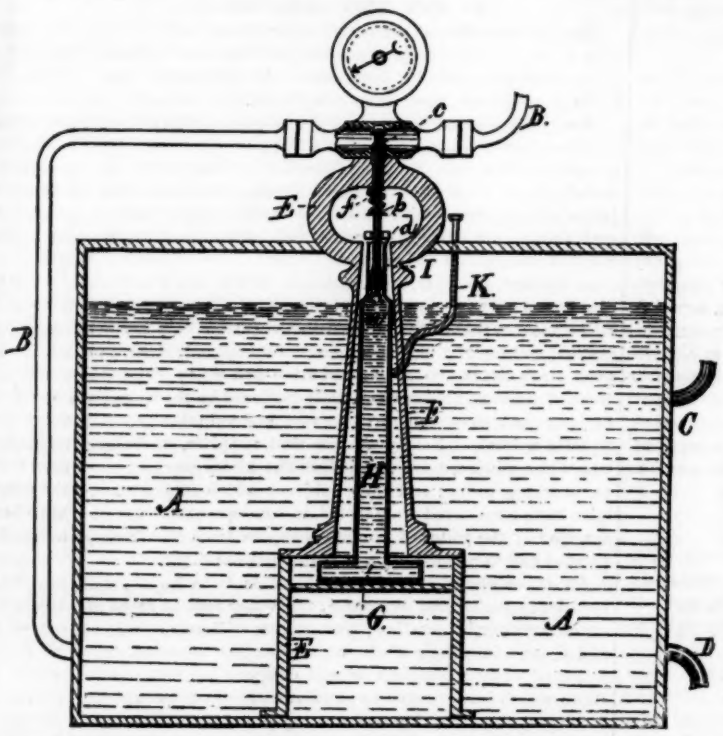
After the water pipe, the safest way of using tobacco is to smoke a mild quality in a pipe made of meerschaum, charcoal, or porous unglazed clay. The pipe bowl then absorbs the oils to a considerable extent, as the coloring of pure white meerschaum plainly shows; and the impurities should be frequently burned out, or new bowls substituted, in order to keep the absorbent qualities unimpaired. The most hurtful method of smoking is the Cuban paper cigarette, where the deleterious fumes of burning paper are added to those of the exceedingly strong tobacco enveloped.

It may be justly considered that in most cases the use of tobacco is an abuse; but it is equally true that devotees of the weed have lived to the most advanced ages, and that thousands habitually smoke without being able to appreciate any deleterious results. There is no standard, therefore, whereby the evil effects of the habit can be gaged for everybody. Dr. Smith, some years ago, read a paper before the British Association, in which he adduced experiments showing that, while tobacco smoking causes a large increase in the rate of pulsation of some persons, in others no increase whatever occurs: and hence he demonstrated a marked diversity in the mode of action of tobacco on different systems. A typical experiment cited is that of a person who began smoking a pipe with the pulse at 74·5 beats a minute. In nineteen minutes the rate rose to 110, then to 112. Finally, at the end of half an hour after the commencement of the smoking, it was at 88·9. For more than two hours it remained above the natural average of frequency and force. In a person of full habit, such acceleration of the heart leads to apoplexy. It is clear that, if in one individual tobacco is able to produce conditions favorable to a disease which may kill at any moment, and in another is practically inert, it is useless to argue either that is generally highly dangerous, or, on the other hand, destitute of dangerous effects. As we said in our previous article, the ingredients of tobacco are separately poisonous; the probabilities are that they are collectively so in every case. But some systems are strong enough to withstand their effects either wholly or in part; and for every individual to discover whether his particular constitution belongs to this last class, involves in all cases a course of experiment in learning to smoke which is universally admitted to be one of the most unnatural, nauseous, and disagreeable experiences of the human existence.

EQUAL parts of tin and copper form a white speculum metal as hard as steel.

THERMOSTATIC APPARATUS FOR CONTROLLING VALVES.

We illustrate herewith a novel device designed for automatically operating and controlling valves in steam or other pipes, which has for its object the retaining at a stated temperature either water or air. A represents a boiler of water, to be heated by the introduction therein of live steam, and an even temperature of the same maintained. B is the steam pipe, through which the steam is conducted. C is the inlet and D the exit pipe, by means of which water is introduced and withdrawn from the boiler or tank. These parts may be of any ordinary form of construction, and therefore call for no detailed description. E is a hollow stand. G is a hollow disk made from brass; and extending upwardly from its center is a brass tube, H. This disk and tube are made of as thin sheet metal as is possible, so as to be very sensitive to the variations in temperature. At the upper end of the tube, H, it is reduced to a less diameter, as shown at I, so as to confine the action of expansion and contraction of the fluid, with which the disk and tube may be filled, to a small column, thus increasing its sensibility and rapidity of action. The upper and reduced end, I, of the tube reaches just above the water line, as shown. Into this reduced tube a piston, *a*, is inserted and attached to a connecting rod, *b*, which extends upwardly through the upper frame of the boiler to the valve, *c*, in the steam pipe, B, to which it is attached. It is provided with a check nut, *d*, which may be adjusted to control the extent of motion. The disk, G, and tubes, H and I, are completely filled with an expansible fluid before insertion in the supporting frame in the boiler. A light spiral spring, *f*, is attached to the connecting rod operating the valve, *c*, and operates to force down the plunger, *a*, as the fluid in the tube, I, contracts.



THERMOSTATIC APPARATUS FOR CONTROLLING VALVES.

The boiler being filled with cold water, the expansible fluid in the disk and tube, H, is contracted so as to drop the plunger, *a*, to the full extent of its downward motion, opening wide the valve, *c*. Live steam then being admitted to pipe, B, it freely passes through the open valve and enters the water in the boiler, heating the same to the degree of temperature desired. This heating of the water conveys its action to the fluid and expands it in the disk and tube, forcing the plunger or piston, *a*, upward, thus closing the valve, *c*, and shutting off the supply of steam, or so much of it as may be necessary. As the temperature of the water falls, the fluid in the disk and tube contracts, and the piston drops with it, again opening the valve and admitting a new supply of steam.

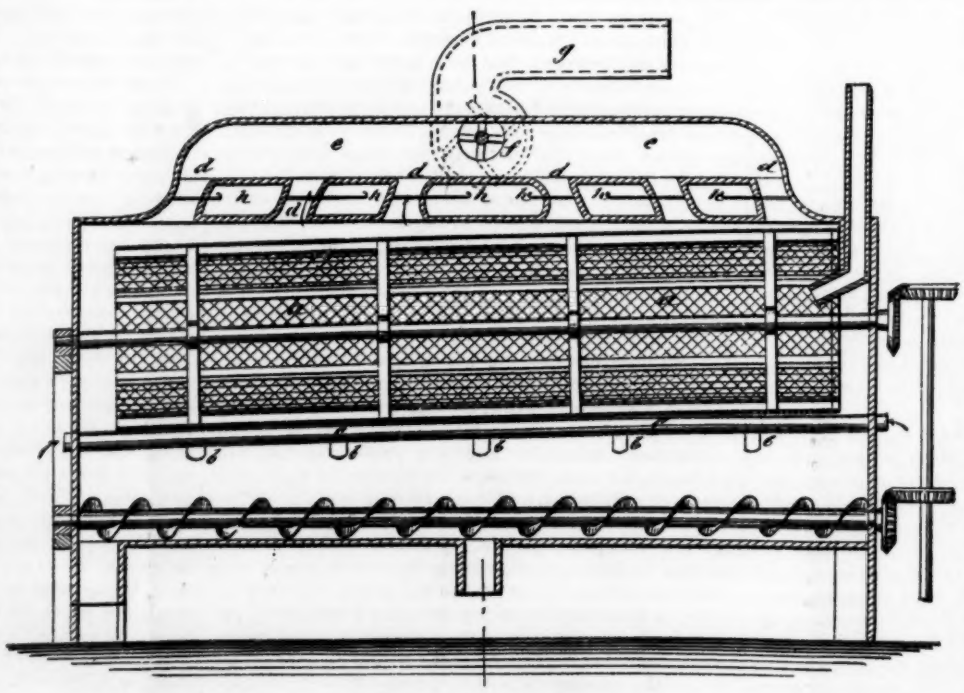
The operation of the plunger, *d*, may be so adjusted that it will rise and fall at a certain degree of heat, or close the valve and open the same at specified degrees of heat, which points may be indicated upon an indicator located above the apparatus and connected with the lever operating the valve, and actuated thereby. It is evident that this indicator will, as the valve rises or falls, indicate the changes and present temperature of the water in the boiler.

This apparatus was patented March 7, 1876, by Mr. H. R. Randall, of Brooklyn, N. Y.

A NEW FLOUR BOLT.

We illustrate herewith a novel apparatus in which an air blast removes the fuzz and fine clammy dust from flour while the material is undergoing separation from bran and middlings in a bolt or reel. The short inlet pipes, *b*, connect with long perforated distributing tubes, which admit air below the bolt, *a*. The air is drawn by the fans through the chamber, *e*, and exhausts at *d*. *g* is the spout to the dust room, and at *h* are slides for regulating the draft.

This device was patented through the Scientific American Patent Agency, September 12, 1876, by Mr. John P. Agler, of Avoca, Iowa.



ALGER'S FLOUR BOLT.

Purifying Calcareous Water.

A company has recently been formed in England to furnish potable water to the large district situated to the northwest of London. Water in that locality, although abundant, is so extremely hard, owing to its filtration through the lime formation, that it is scarcely utilizable. The object of the company is to remove the calcareous matter, and to this end extensive buildings and reservoirs have been constructed. The water is pumped up from wells directly under the works, and is purified in the following manner: Quicklime is slaked in a circular basin and mixed with water in other receptacles, so as to form a milk. This, by its weight, travels into the main reservoirs, which contains 2,000,000 gallons of water, and is allowed to act on the water for about five hours. At the end of this time the bicarbonate of lime held in solution is precipitated, and the water is pumped off into a distributing reservoir. The lime is frequently removed and sold for agricultural use.

The Machinery Exhibit.

A mechanician, alluding in the London *Times* to our mechanical exhibit, acknowledges that the display of machinery at the Philadelphia Exhibition has never been equaled, either for quantity, or for quality, or for fitness. The grand effect which it produces, adds the writer, is no mere result of repetition according to well known forms of construction, but is due to abounding novelty, originality, and progress. This department of the Exhibition has a strongly marked American character, and can hardly be regarded as an international competition. Other civilized countries, it is true, take part therein, and Great Britain especially, but the aggregate does not equal one fourth of the articles exhibited from the United States. There is also marked evidence of patriotic spirit in the prodigious efforts made by individual citizens and firms to sustain worthily the mechanical reputation of the country. The extent, the money value, the excellence and originality of the objects displayed by them impress a stranger immensely; and however much he may have seen of former international exhibitions on the grand scale, these impressions survive.

The Sonorous Qualities of Metals.

M. Decharme has recently concluded a series of experiments to determine the sonorous capabilities of different metals. Cylindrical rods, 7·8 inches in length and 0·39 inch in diameter, were suspended by threads or rested on cork prisms. Each was struck by a piece of wood covered with rubber. As regards number of vibrations, lead was found to yield the lowest, or in the ratio of 690 to the maximum of 2,762 for aluminum. The intermediate results are: For gold 976, silver 1,034, tin 1,161, brass 1,303, bronze 1,381, zinc 1,422, copper 1,462, cast iron 1,843, wrought iron 2,192, and steel, 2,322. As regards duration of sound, the following results were obtained in seconds of time and fractions: lead 0·3, tin a little less than 1, zinc 1, cast iron a little less than 2, copper about 5, wrought iron 12, brass 14, bronze 24, steel 45. The author notes the fact that a steel rod, when supported on the sides of cork prisms, gives a sound which lasts but 25 seconds, or but little over half the period as when the steel is suspended. Brass, on the contrary, sounds from 20 to 25 seconds when on the corks, instead of 24, as when suspended by the thread.

Painless Extinction of Animal Life.

"The latest experimental researches which I have conducted on lower living animals," says Dr. B. W. Richardson, "have had for their object the discovery of a ready, cheap, and innocuous method for killing without pain those animals which are destined, as yet, for the food of man. If the labor of the physiologist be allowed to progress, the day will soon arrive when the slaughter of animals for food will become unnecessary, since he will be able to so transmute the vegetable world as to produce the most perfect and delicious foods for all the purposes of life without calling upon the lower animal world to perform the intermediate chemical changes. But until this time arrives, animals will have to be slaughtered, and my research has been directed to make a process, which at present is barbarous and painful, painless in the most perfect degree. For this purpose the various modes of rapid destruction of life—by powerful electrical discharges, by rapid division of the *medulla oblongata*, and by the inhalation of various narcotic vapors—have been carried out. The experiments, which have been exceedingly numerous, have led me to the conclusion that the most perfect of the painless methods of killing is by the inhalation of carbonic oxide gas. So rapid and complete is the action of this gas that I may say physiological science has done her part, as far as it need be done, for making the painless killing of every animal a certain and ready accomplishment, an accomplishment also so simple that the animal going to its fate has merely to be passed through the lethal chamber, in order to be brought, in senseless sleep, into the hands of the slaughterer. The application of teaching and the putting into practice this humane process lies now with the world outside Science; but to insure its acceptance, all the force of selfishness, of prejudice, and of practical apathy for the sufferings of the animal creation, has to be overcome. There is a great deal of talk and a great deal of sentiment abroad on the question of the sufferings of the lower animal kingdom; but when an attempt is made to relieve those sufferings by the invention of methods for operating surgically, without the infliction of pain, or for painless killing, the true and vital sympathy, which one would expect in support of such practical and humane efforts until they are made perfect and universal, can scarcely be said to be found at all. With the exception of a few, not a dozen altogether, of really humane ladies and gentlemen, I have found no one, out of the ranks of Science, in the least interested in the saving of sufferings to which I am now directing attention. The man of science stands and wonders at the strangeness of the psychological problem before him; and, in spite of himself, is forced to the conclusion that, practically, the noise that is made at him in the name of humanity is, after all, sounding brass and tinkling cymbal."—*Nature*.

The Cost of Big Guns.

The trials of the 81-ton gun which have recently taken place in England are reported as being conveniently satisfactory to the artillerists; but it may be doubted whether those who are footing the bills, the tax payers, will share in the officially expressed gratification. At every discharge of this monster weapon, over 300 lbs. of powder are exploded at a cost of from $125 to $150. To this must be added the expense of shell and fuses. Then the gun itself, originally estimated to cost $40,000, has actually necessitated an expenditure of some $125,000, besides the construction of a railway at Woolwich, a barge for its transportation, and several huge cranes. Moreover the firing of the gun at Shoeburyness has had the effect of blowing down or at least seriously shattering the huts and cottages of that military settlement, so that it will nearly all have to be rebuilt at government expense. Meanwhile, on this side of the Atlantic, we complacently view these rather costly proceedings, profit by the results of the experiments, and congratulate ourselves that we are not paying for them.

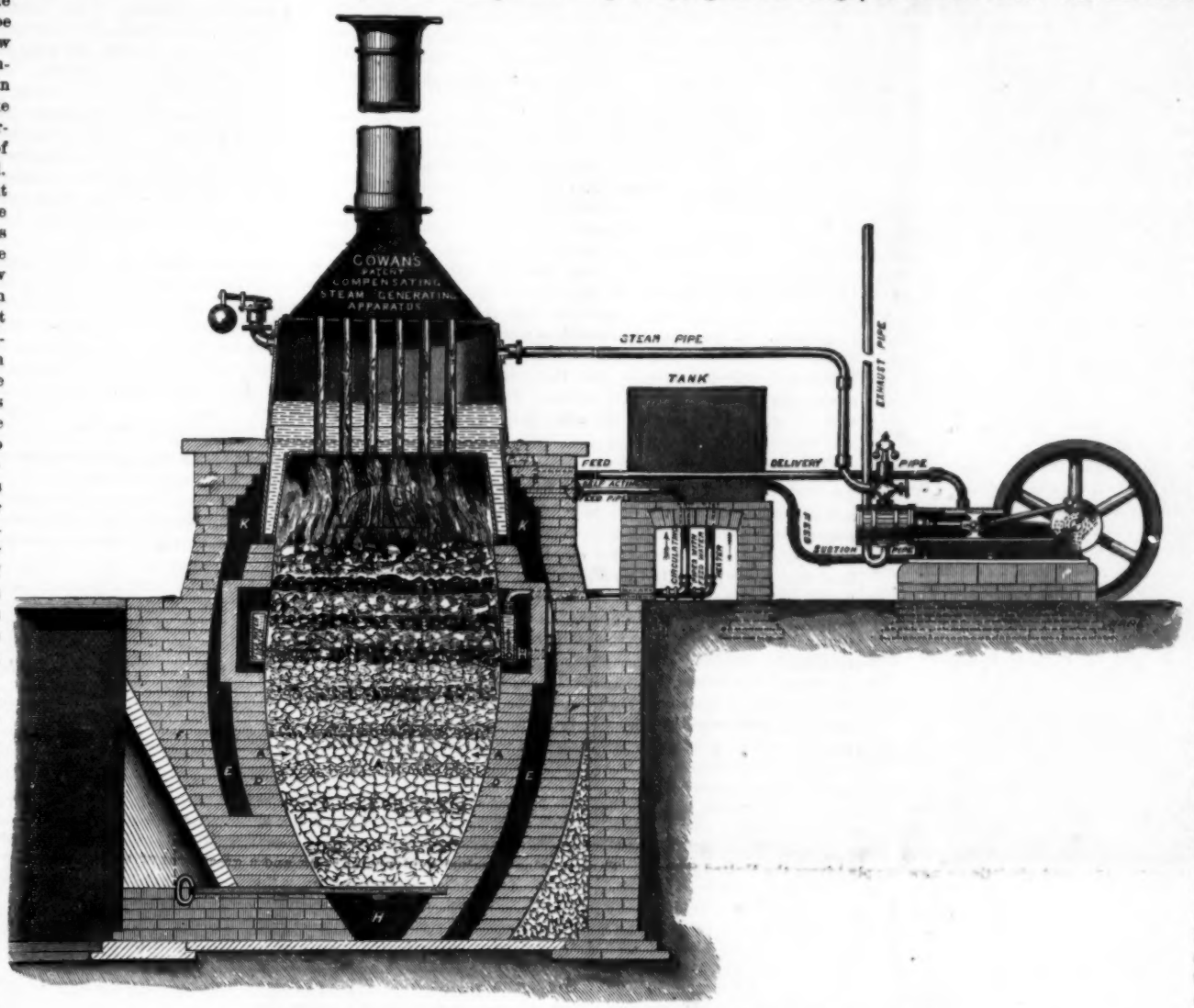
THE secret of making the hammered bronze Chinese gongs and Turkish cymbals consists in forging the bronze into shape while hot.

COMPENSATING STEAM GENERATING APPARATUS.

Mr. John Cowan, in the apparatus illustrated herewith, has devised a certainly novel and ingenious and, according to the practical results which he reports to us, an important method of economizing in the use of steam. It opens the possibility of getting steam for nothing, and even making a small profit—a condition of affairs somewhat difficult to realize. Mr. Cowan's plan is a genuine one, however, and because it is so it is unlikely to carry conviction speedily with it; but as we said before, he has the figures, and, what is better, can point to its successful practice in this country in at least one good instance.

The gist of the system may be explained in few words. In burning limestone in the kiln to make lime, an enormous amount of heat is wasted. Still the amount for which the lime will sell pays a profit despite the waste. Now there is no reason why this lost heat should not be utilized, Mr. Cowan argues, and he further believes that the limestone in burning adds to the heat; whereupon he builds his steam boiler over and about a furnace suitable for the calcining of lime, and makes steam, which costs nothing, with the waste heat which costs nothing.

Sometime ago we explained the hot water apparatus which had been constructed on this principle for heating green houses and buildings. At the present time the inventor goes a step further, and has contrived an application to steam boilers to supply motors with steam, and thus he proposes a means whereby power can be obtained at practically no cost.



COWAN'S COMPENSATING STEAM-GENERATING APPARATUS.

The new apparatus is illustrated in our engraving. A is the furnace, B the boiler, and C a feed water heater. At D is the firebrick lining, and at E and F the air space or sand backing and masonry. H is the drawhole for removing the lime, and K is the flue boiler. The use of the remainder of the apparatus is evident in the engraving. Layers of limestone and coal (anthracite is the best) are placed in the furnace, and the whole fired. The lime remains in lumps, while the coal goes to impalpable ashes and practically disappears. During the night, when fires should be banked (a process of course out of the question while the lime is being burned), the escape of steam is provided for, and an automatic apparatus preserves a constant water level in the boiler. The evaporation is thus kept going on a half rate, or thereabouts, during the night; and in closing the escape valve and opening connection with the engines, work can be begun in a few minutes. The labor required is said to be no greater than in firing with an ordinary boiler, and the furnace or kiln can be made any size. In fact, with the exception of the extra depth and the necessity of an aperture for removing the lime, the furnace is not materially different from that of any steam generator.

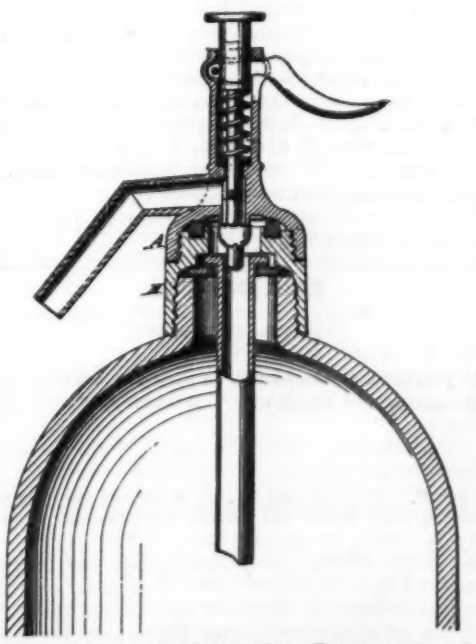
The inventor submits testimonials showing that in England a six horse engine was used, for driving a mortar mill and other machinery, at a cost for fuel of only from $1.25 to $3.75 per week. He also states that a 15 horse power engine, running under a minimum pressure of 45 lbs., has been operated at an average weekly cost for fuel of $4.52. It is in heating greenhouses that cases have occurred where the system has yielded a clear profit over all expenses. At the gardens of Stackpole Court, the property of the Earl of Cawdor, in England, the cost of heating the greenhouses was $487 yearly, with nothing on the credit side but dust and ashes. When the limekiln was used the cost was $425.16, and as the produce of lime sold for $477.25, it will be seen that the new apparatus thus cleared its cost and left a balance of over $50, which, added to the cost under the old system, left a profit of some $540.

In this country, where limestone and other carbonates of lime are abundant, and can almost always be obtained for the mere cost of quarrying and hauling; and where anthracite coal abounds, it is believed that the process can be carried on even more economically than is indicated by the foregoing figures. In addition to its application to steam boilers and to greenhouse heating, the invention has likewise been adapted for gas manufacture, and is said to be very successfully employed for this purpose. In fine, the uses to which the apparatus may be put embody all those where economy of working is the great desideratum, such as for pumping, driving stone-crushing machinery, mortar mills, etc., and for contractors' use, in the construction of railways, docks, and other works where large quantities of lime are required for building tunnels, bridges, retaining walls, etc.; also for draining mines and quarries, irrigation and sewage works, for use in chemical works and breweries, and where evaporation is carried out on a large scale.

Mr. Cowan, the inventor, is now in this country, and may be addressed at the Astor House, New York city. He is desirous of disposing of all his American patents relating to the device. Through the kindness of Matthew Baird, Esq., of Derby Road, Philadelphia, Pa., an apparatus of this kind can be seen in successful use.

IMPROVED SIPHON HEAD FOR BOTTLES, ETC.

Mr. Joseph W. Stillwell, of Peekskill, N. Y., has patented, through the Scientific American Patent Agency, September 26, 1876, an improved siphon head for mineral water bottles, etc., illustrated herewith, the object of which is to enable the valve of the head to be removed and repacked or repaired without disturbing the connection between said head and the bottle.



The novel feature is an extension collar, H, upon which is formed a screw thread to screw upon the neck of the bottle, and another a screw thread to screw into the inner surface of the base, A, of the head. Upon the collar, H, is formed a groove to receive a packing ring, which is pressed against a shoulder of the base, A, to prevent any leakage. Around the opening through the collar is formed a recess to receive the upper end of the glass pipe, and a shoulder to receive the packing that prevents leakage through the joint between the collar and bottle. With this construction the head can be unscrewed from the collar, H, and detached, and the valve repacked or repaired without disturbing the connection between the collar, H, and the bottle, and without disturbing the position of the glass pipe.

The Carpet-Eating Bug.

For some time past the housekeepers in Schenectady and in Utica, N. Y., have suffered from the ravages of a peculiar bug, which, though wholly unlike the carpet moth, is nevertheless fully as persistent a destroyer of carpets. It infests the edges where the fabric is nailed to the floor, and eats large holes. Occasionally entering a crevice between the floor planks, it follows the crack, eating as it goes, cutting the carpet as cleanly as if shears had been used to divide it. The depredations of the insect have lately increased, and the pest seems to be spreading to cities adjacent to those above mentioned.

In appearance the insect is ovate, about ¼ inch in length, and is thickly clothed with numerous short bristles like hairs, terminating in a bunch forming a tail. It is exceedingly active in its movements. Professor Lintner, of Schenectady, who recently examined the bug, pronounced it the larval stage of a beetle, and in all probability a member of the very destructive family of *dermestidæ*, and belonging to the genus *anthremus*. Quite lately he succeeded in obtaining the first example of a perfect insect, a very minute beetle, approximately 1/10 inch in length, but beautifully marked in red, white, and brown. This was submitted to Dr. Leconte, of Philadelphia, and that distinguished authority confirmed Professor Lintner, and determined the bug to be the *anthremus scrophulariæ*, a very common destructive insect in Europe, but never hitherto detected in the United States. It is allied to the *a. varius* or museum pest, which destroys stuffed animals and similar objects in museums. No preventive measures against the insect have yet been found.

The Centennial Main Building To Remain.

The Fairmount Park Commission has yielded to the popular demand, and the Main Exhibition Building is to remain, to be used as a grand bazar and industrial fair: with the proviso, however, that the structure is to be removed after two years' notice shall have been given. The charge for admission is restricted to 25 cents for five days of the week, and 10 cents on Saturday; and when the income it yields is sufficient to pay expenses and interest on the investment, the admission fee is to be still further reduced, so that the public may enjoy the exhibition at the lowest possible charge for entrance.

The British Government has recently presented Philadelphia with the handsome buildings now occupied by the British Commission. What with the Main Building, Memorial Hall, Horticultural Hall, and probably Machinery Hall, together with the British edifices, the statues, etc., it appears that a considerable portion of the Centennial structures will be left, affording all the facilities for a very large permanent display.

The Exposition will close on November 10; but visitors will continue to be admitted as usual after that date, in order to provide necessary funds to defray expenses of police maintenance, etc.

Continued from first page.

for some 20 hours, and finally the bubbles disappear, and the now fluid mass becomes homogeneous and clear. Then the furnaces are allowed to cool until the contents of the pots become pasty and viscid, the proper working state; and the heat is subsequently maintained at a degree sufficient to keep the glass in this condition.

At the Exposition, the glass is mostly pressed at once into the required form. Some blown glass is made, but the sketches shown on our initial page relate mainly to the former operation. The mold, which is represented taken apart, so as to show its construction, is one of those designed for pressing goblets. It consists first of two hinged iron pieces, in each of which are hollows, corresponding in shape to the portion of a goblet below the bowl. The ring portion shown, above the mold proper, holds the glass which forms the bowl of the goblet, and the still smaller ring above fits in the one just mentioned and limits the hight of the bowl in the mold. Lastly, the conical plunger enters the bowl portion, and between it and the mold the glass is pressed into proper cup shape.

The mold is placed on the greased metal table of the press, as represented in the sketch, and the plunger is attached to a screw rod which passes through a crosshead which slides on vertical guides. The cross head is eccentrically connected to disks on the side of the machine by pitmans, and to one of these disks is secured the long lever manipulated by the workman. The apparatus being ready, a "gatherer" takes a long iron rod called a punty, to the end of which a little ball of viscous glass is attached. This he dips into the pot of molten glass, and twirls it around until a moderate sized nodule is gathered on the end. Carrying his rod over to the press, he holds it so that the glass slowly drops into the mold, until the workman deems that a requisite quantity has entered, when a pair of shears is used to clip off the material. If too much glass remoins on his punty, the gatherer rolls it along the edge of the iron slab beside the pot of water shown, when the excess of glass falls hissing into the water, and the remainder is rolled into a neat ball. The pressman now pushes his filled mold under the plunger, seizes his lever, and forces the plunger down with such force that the hot glass is driven into every crevice of the mold. A moment of waiting follows, the plunger is thrown up by the action of heavy spiral springs, the mold is drawn back and opened, and there stands the goblet, rapidly changing from cherry red to its natural transparency. An attendant now has ready a punty with a bit of hot glass at the end, which he deftly attaches to the bottom of the article, to serve as a long stem. The goblet is thus carried to the glory hole, a smaller furnace, and here it is reheated. This gives it its subsequent polish. While hot and blackened, it is removed and passed to a workman who sits on a bench on each side of which are long inclined iron-covered arms. Taking the stem or punty in his left hand and resting the object on one arm of his chair, the workman rapidly rolls it forward and back, holding meanwhile inside the bowl a flat piece of charred stick termed the "battledore." This smooths the glass and renders it perfectly circular in shape. Next the punty is removed, and another stem is attached to the bowl portion, as shown in the sketch. The glass is again rotated as before, and the workman now holds against the bottom the flat upper portion of his tongs or "pucellas." This tool is represented separately in the engravings. The effect of this is to smooth the bottom and render it perfectly flat.

When these operations are concluded, a boy seizes the glass in a fork, and carries it to the annealing oven and stands it on the floor. Here the annealing is continued over several hours at a low heat; and as it concludes, the floor of the oven is carried rearward, so that the glass passes into cooler compartments and finally is withdrawn at the rear. Grinding the bottom smooth on a grindstone follows, and any engraving or like ornamentation is done. Nothing then remains except to polish the glass, when it is ready for the market.

When glass is blown, of course no pressing operation comes into use. The blower first gathers the requisite amount of glass on the end of a long tube and rolls it on a smooth polished cast iron slab called a "marver" until it assumes a cylindrical form. Then he blows into the tube, expanding the glass as much as he thinks necessary, and also swinging the tube when he desires to elongate the object; then by means of tongs, scissors, and battledore, he molds it into the desired form. After the shape is once produced, the subsequent operations are similar to those already described.

THE MEETING OF THE NATIONAL ACADEMY OF SCIENCES.

We give below our usual brief abstracts of the principal papers read before the above-named body at its recent meeting in Philadelphia.

General H. L. Abbott gave a synopsis of the results obtained by his observations of the

VIBRATIONS FROM HELL GATE.

The instrument employed at the various stations, for noting the vibrations, was a seismograph, which principally consists of a basin of mercury, giving what is called an horizon of that metal. The agitation of its surface when the vibrations reach it is observed by telescopes with delicate means of measurement. So easily is it disturbed that the footfall of a horse 300 feet away is at once indicated. A number of experiments led to calculation that the explosion on Hallett's Reef, where 3,680 charges were fired simultaneously, ought to be indicated at 59 miles; but General Abbott was very anxious to obtain something more than negative or doubtful results, and hence selected distances not much over 9 and 12 miles. An observation was attempted at West Point, 52 miles away, and no results were obtained. The stations used by General Abbott are all on Long Island; their distances from the reef were very accurately ascertained, and are given in round numbers in the table below:

Stations.	Distance, miles.	Arrival in seconds.	Velocity of transmission in feet per second.
Fresh Pond Junction.....	5¼	63·0	3,873
Jamaica.....	9½	23·5	4,521
Willett's Point.....	8½	72·3	8,300
Springfield Junction.....	12¾	19·0	5,309

The sound, as distinguished from the rumbling of the earth, is described as a dull roar such as comes from a torpedo explosion at a distance. At Springfield Junction, the noise is spoken of as a low, rumbling sound, gradually increasing to a maximum and then dying away.

General Abbott said that he had never seen so quick an explosion. Within half a second of the actual time of firing, the water of the East River thrown up had reached half its hight. During the discussion, Professor O. N. Rood referred to Professor Mayer's experiments at South Orange, N. J., which gave for the vibrations from this explosion a speed of about 3,000 feet per second. Professor Henry mentioned the curious coincidence that the boiler of the Lighthouse Board's steamer sprung a leak at the time of the Hallett's Point explosion; steam had been blown off just previously. It was also mentioned in connection with the theories of vibration that nitroglycerin will tear gun cotton to pieces if exploded upon it; but the cotton does not explode. But if the converse experiment be tried, the explosion of gun cotton sets off the nitroglycerin. Gun cotton will not explode gunpowder.

Professor Loomis discussed

LAST SUMMER'S HOT WEATHER,

and stated that during the whole "heated term," a low barometer was associated with high temperature. On a very hot day, especially selected for observation, the excess of heat was about 20°. Of this about 10° may be fairly attributed to southerly winds bringing hot air from the more heated regions to the south of us. For the other 10°, Professor Loomis proposed to account by the prevalence of extraordinary dryness at the northwest—a region usually dry indeed in summer, but in this instance subjected to unusual drouth, while southerly winds, sweeping over it, kept back the north wind by which it is ordinarily visited at intervals. Here a stratum of heated air was continually formed, which supplied to the general weather of the country 10° of the extra 20°.

THE SUN'S TEMPERATURE.

The actual heat of the sun's surface is one of the unsettled questions of Science, and estimates have varied between 10,000,000°, and 2,700° Fah. Professor S. P. Langley read a paper detailing how he compared the sunlight with that from the molten steel poured out of the Bessemer converter, and thus approximately estimated the solar temperature. A heliostat arrangement was employed to transmit a sunbeam into the foundry of the Edgar Thomson Steel Works, and a Ritchie photometer was used to measure the respective intensities of the lights. The first conclusion reached was that the sun's light, which turns the light from the molten steel into a black spot, must be at least 50 times the greater. Then the spectroscope was employed and the two rays compared. The steel rays were again blotted out. Hence the sun rays must have been at least 64 times brighter. Next, Professor Langley made comparisons of the sun's rays with those from the flames above the converter, when the latter were at their brightest. This was a less difficult proceeding and furnished more specific results. The photometric comparison could be made directly. It is admitted, however, that the flame light may not be quite as bright as that of the molten steel. The arrangement was somewhat like that of a camera obscura. It gave the image of the sun so accurately that sun spots could be easily examined; it also gave an exact representation of the furnace flame. Each was alternately superposed on the other. The conclusion is that the sunlight is at least 2,168 times brighter than the furnace flame. As the heat is presumably of the same relative order, the result is adverse to the law of Dulong and Petit. The actual heat of the sun is probably among the higher values that have been suggested.

Professor Henry's important paper on ocean echoes we reserve for fuller review.

Correspondence.

Centennial Awards.

To the Editor of the Scientific American:

In your issue of October 28, on page 273, are some editorial comments, to which a few additions may usefully be made.

If there are a large number of awards, it must be remembered there are a large number of exhibits; and there may be a few judges or groups of judges that did not fully comprehend their duties, the consequence being that mistakes may have been occasionally made. I know, indeed, that some judges have not recognized the difference between a report and an award, and that awards have been made which are mere copies of the reports by secretaries of groups, who did not quite understand the difference; and the General Board of Judges could not go well behind these awards without the greater chance of injustice to the exhibitors. I fancy, however, that these cases must be very few. I have been a juror in a group that has had almost continuous exercise since the beginning; and considering the novelty of the plan, I am surprised to see how few are the exceptions to its working well.

Your statement of the plan is not quite correct. You say: "The judges simply write reports on exhibits which they deem commendable, and the Centennial Commission thereupon decides which out of the exhibits so reported on are entitled to the medal and diploma." I will not say what some groups of judges may have understood to be their duties; but our group not only reported on those they deemed commendable, but on every person's exhibit. The failure to send in descriptions, to which you refer, made no difference; these requests for descriptions were only to ascertain what the exhibitor claimed. If no description came, the judge used his best judgment. The Centennial Commission did not select, from our report, the awards. We selected them ourselves from our own reports. These have to be confirmed by the Commission. The actual merit of every man's exhibit is the matter of the report; the special merit, the matter of the award. To show you that awards are by no means so freely scattered as you suppose, I will say that, in one particular line of articles, I examined five hundred and twenty-six different exhibits, and have notes of each exhibit on my judge's memorandum book; only forty awards were made.

It is quite possible that some of the judges have not understood their duties under the system, or the system itself; but this should not militate against the whole system, which, from the extended experience I have had of it now, I believe to be the best ever devised, and far superior to the old plan of specified premiuns for specified articles, of which, too, in times past, I have had an ample experience.

Philadelphia, Pa. ONE OF THE JUDGES.

[For the Scientific American.]

CUTTING A LEFT HAND SCREW WITH A RIGHT HAND TAP.

J. W. S. sends us an interesting letter upon a method of cutting a left hand screw with a right hand tap, which we herewith illustrate. Fig. 1 represents a piece of iron with

Fig. 1.

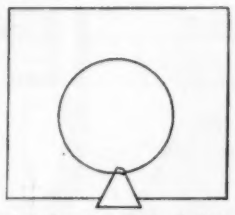
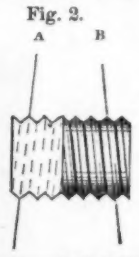


Fig. 2.



the hole (of the size of the bolt to be threaded) drilled in it. A V slot is then cut in it, and a tap ground to an angle with the thread left on the narrow end, which projects into the hole. If, then, the bolt be placed in the hole and the tap in the V slot, and we screw the whole into a vise, with the jaws gripping the back of the tap and the opposite side of the piece of iron, the pressure of the vise will hold the tap and force it to its cut, which is taken by screwing the bolt through the hole in the piece of iron.

The reason why this can be done is as follows: Suppose that Fig 2 represents a piece of iron with a thread cut upon it, and that at one end it is filed down to half its diameter, as shown: it is evident that the side of the thread furthest from the observer stands at an angle slanting from the left to the right, during half its circumference, as denoted by the line, A, shown; so that, if we commence at the bottom and follow the thread for one half a revolution, we shall advance in the direction of A; whereas, if we perform a similar operation, beginning at the bottom on the other side of the thread, we shall, in moving half a revolution, travel in the opposite direction, B: showing that, notwithstanding that the thread advances in one direction, its threads slant in an opposite direction on one half of the circumference as compared to the other.

J. W. S. uses one side of the thread to cut the other with, and thus reverses the angle; and if he will turn to page 21, volume XXXI, SCIENTIFIC AMERICAN, he will find the same principle explained for cutting up inside chasers, in which operation a chaser, to cut a right-handed thread, must, to have the teeth start in the right direction, be cut off a left-handed hub. J. W. S. has, however, given us a new application of the principle. J. R.

New York city.

Watering House Plants.

If the causes of failure where plants are cultivated in windows were minutely investigated, the system of watering would be found to be the principal cause. A plant ought not to be watered until it is in a fit condition to receive a liberal supply of that element, a good drainage being previously secured, in order that all superabundant water may be quickly carried off. Those who are constantly dribbling a moderately small quantity of water upon their plants will not have them in a flourishing condition for any length of time. This must be obvious to all, for it is quite evident that the moderately small quantity of water frequently given keeps the surface of the soil moist; while at the same time, from the effects of the good drainage, which is essential to the well being of all plants in an artificial state, all the lower roots would perish for water, and the plant would become sickly and eventually die. In many instances when the contents of flower pots are sprinkled daily with water, the soil in the middle will become hard and dry. When the ball of earth becomes dry, it takes water a long time to penetrate it, and surface waterings do not accomplish the object. In this case set the pot in a pail of water, and let it soak until the earth is thoroughly wetted through. If pro-

per care in the respect above mentioned fails to induce a proper growth, then the plant must be re-potted with fresh earth, and have a portion of its top cut back. Irregularities in shape must be corrected from time to time by pinching off the shoots which may start to grow out of place.

The red spider is quite averse to moisture; the green fly, however, likes it, but may be destroyed so readily by tobacco smoke that only neglected plants will suffer from this cause. The mealy bug is so large that it may be easily picked off.

Watering must be properly attended to; and while the plant must not suffer from lack of moisture, the roots must not be kept saturated with water. The sound of the pot when struck by the knuckles is quite different from what it is when dry. This, and the lagging look of the plant, will indicate that water is needed. A little practice will soon enable one to anticipate the wants of the plant and to supply water at the proper time. Plants growing in a cool atmosphere will be found to flourish much better by giving them water which is almost hot. House plants that have bloomed freely during the winter should be denied their usual supply of water, and be placed in the open air for a few hours during the middle of bright days, if this course is practicable.

PRACTICAL MECHANISM.

BY JOSHUA ROSE.

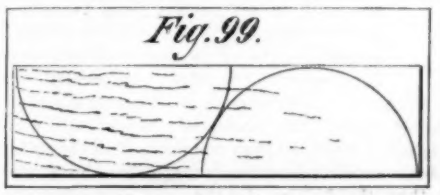
SECOND SERIES—Number XIV.

PATTERN MAKING.

The construction shown in Figs. 92, 93, and 94 is so nearly the same, and the slight difference is so obvious, that an explanation of Fig. 94 will cover the ground. For Fig. 94 we plane up a piece over twice as long and more than half the size of the required flange, and out of this piece cut the two half flanges. If, however, the flange is of sufficient size to make it necessary to study economy, the two half flanges may be set out on the plank, lapping each other, as shown in Fig. 99. We next, with a flat scriber, draw a line on the chuck exactly through its center, and set the half flanges to this line, and then screw them to the chuck and turn them as if they were solid. By setting the halves exactly true to the line, it is insured that the flange shall part exactly at the center.

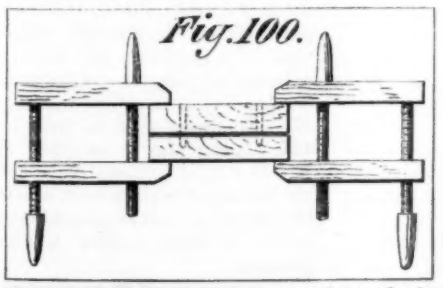
To make the pattern shown in Fig. 93, we take two pieces

Fig. 99.



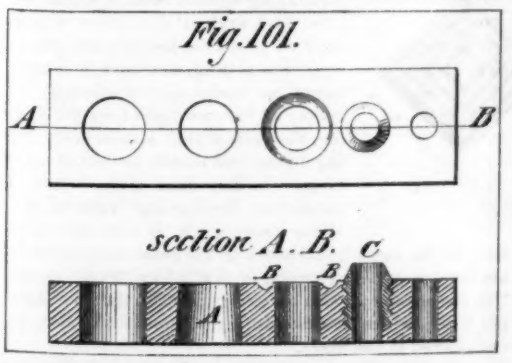
of wood long enough to make the two halves, and allow about half an inch or an inch to turn off each end, so that the impressions of the fork and center may not appear on and disfigure the finished work, and for other reasons hereafter to be mentioned. We plane these pieces on one edge and on one face, making them of equal thickness. We make the flat surfaces, which come together, true, trying them with the winding strips shown in Fig. 37, to detect any twist. Our next operation is to insert the pegs, and we may, for this purpose, adopt either of the two following methods, the more ready of which we will take first: Clamping the two jointed faces together, as shown in Fig. 100, we bore

Fig. 100.



two holes right through the top piece and into the bottom, one to a little greater depth than the hight to which the pin is intended to project, as shown by the dotted lines. We then plane up a piece of hard wood, about two and a half feet long, to fit the holes tightly. It is just as easy to plane a long piece as a short one, and what is left over will serve for a future occasion. A useful tool for preparing pin stuff is illustrated in Fig. 101, which represents a hardened plate

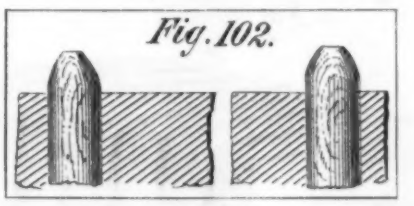
Fig. 101.



of steel, pierced with holes of the sizes of the pins usually required. The wood for the pins, having been planed up to the required size, is driven with a mallet through the plate, saving a great deal of time, and making the pins more nearly round than is possible by hand work. In some of these plates the holes are made taper, as shown at A, in Fig. 101; this, however, is detrimental, and the parallel hole is the best, because it guides and supports the stick while it does not impede the cutting action of the tool. A hollow formed around the edge of the hole, as shown in the sectional view, at B B, would improve that action; or it might be still further improved by inserting bushes in the plate, with a portion left projecting above the plate and beveled off to resemble a chisel, as shown at C.

The pin stuff being prepared and inserted into one half of the pattern, the projecting end is then tapered off as shown in Fig. 102. The formation of this projecting pin may seem

Fig. 102.



a very simple matter; but if sufficient consideration is not given to it, a great deal of annoyance is caused to the molder, and the castings will be imperfect. If we reflect for what purpose these pins are inserted, we shall find the proper shape. First, with regard to the projecting length, some workmen seem to be guided by the diameter of the pin, making it project to a distance equal to its diameter; but it is obvious that a short peg or pin will govern the position as well as a long one, and will be less liable to stick in the loose half of the pattern: hence it is better to let the protruding end stand out from three sixteenths to one half inch, and let from one sixteenth to one eighth inch of the large part fit the hole, the nut being tapered off so as to be sure that the pin can be released easily. These conditions inevitably bring us to the parabolic form shown in Fig. 102. Another point to be observed is to make the pin of as large a diameter as is consistent with the work; for the larger the pin, the longer it will remain free from shake. Above all, it is essential that the pin be perfectly round at the part that fits the hole; and if these elements are neglected, castings will be produced of which the halves will not match, which is always very unsightly. Nothing is gained by making the pins to a tight fit in the loose half of the pattern, as they will not work that way; and the molder will enlarge the holes with a red hot rod, and then, after a little while, the charred part around the hole falls out, and the pin becomes too slack.

After inserting our pins, the two halves of our patterns are to be fastened firmly together; and this may be readily done by brushing the end faces with hot glue for a breadth of one half or one inch, according to the amount we have allowed our pieces to be larger than the finished work. Then we hold them firmly together with a screw clamp, leaving them until they are perfectly dry. If there is not time for the gluing, the two halves may be screwed together; and indeed, if the job be a heavy one, it will not be safe to trust entirely to glue, but to use screws or dogs. Dogs are a kind of square staple, made of steel, and of the form shown in Fig. 103; and two of them driven in each end of a pattern will hold its loose halves very firmly together. While very handy, however, on large or small work, they are cumbrous; and the gluing or screwing is preferable. The work can now be mounted in the lathe, and turned as though it were solid. Care must be taken that the center points are exactly in the joint, and it was to ascertain if this was the case that our two halves were planed of equal thickness; for if, in the process of turning, one flat is seen to be narrower than the other, as shown in Fig. 104,

Fig. 103.

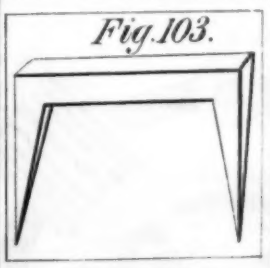
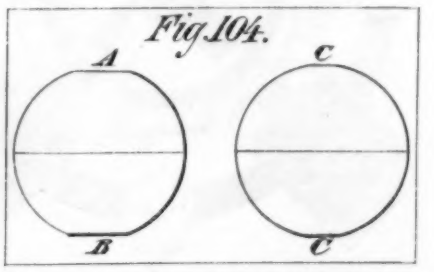


Fig. 104.



at A B, it is proof that the centers are not in the joint; and unless the error is corrected, one half of the finished pattern would be thicker than the other. To remedy the error, we tap the pattern lightly with a hammer in the required direction, and then screw up the lathe centers a little more, continuing the process until the flat sides upon the pattern, when very nearly trued up, as shown in Fig. 104, at C C, are equal, and finally disappear.

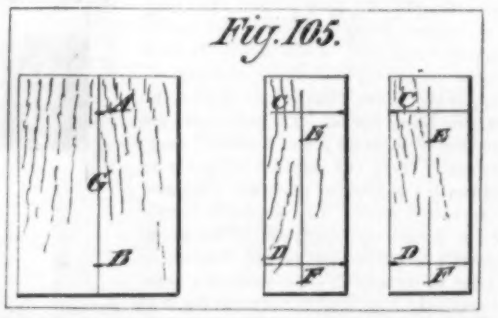
Our pattern being then turned and sandpapered, as already directed, the next proceeding is to stop up all holes or cracks that are not desired to appear, with either beeswax or putty. This is a simple process, but it may have been noticed that some workmen take a much longer time over it than others, at least when beeswax is the stopping material. One who is expert at this work guesses just the proper amount necessary for each hole or crack; then he forms the wax into a worm-like shape, and with a warm chisel (that is not hot enough to make the wax run but only to cut it easily) he presses the wax into the hole, and seldom leaves any surplus to remove. The same knack is necessary in filleting, that is, in filling in an internal square sharp corner, when it is thought too small to be filled in with wood; for if the worm or string of wax of the right size be laid along the corner, the pressure of a warmed gouge will cause it to expand to the required fillet; while if too much wax is inserted, much time will be occupied in trimming off the surplus.

The third and last of the finishing processes is the application of two or more coats of spirit varnish, which adds to the appearance of the pattern, and increases its durability by giving it a surface impervious to water, and by producing that smoothness so necessary for its easy extraction from the sand. A varnished pattern escapes much of the rough usage commonly bestowed upon patterns, because the molder does not rap it so much as he otherwise would do. Several thin coats of varnish give a much finer appearance than fewer and thicker ones. The first coat fills up the pores of the wood, and frees the fibrous projections left by the sand paper; and after the first coat is dry, fine sand paper is again applied to remove the fibers so fixed. The second and succeeding coats give the gloss.

The pattern maker invariably mixes his own varnish, which he does in the following manner: The varnish pot should be of stone, and not of iron, which would discolor the varnish. The cover should be of thick leather, having through the middle a hole of such size that the brush handle, forced through it, will be suspended, and will not pass through to the bottom of the pot. The object of making the cover of leather is that the varnish collects around the lid and sticks the cover down, requiring sometimes so much force to remove it that wood would be liable to split. In the pot is placed so much shellac, and there is added just sufficient alcohol to cover the shellac, the whole being occasionally stirred with a piece of stick, and not with the brush. The consistence should be that of raw linseed oil; and to hasten the mixing, a little warmth may be applied. The color of the varnish used is, strictly speaking, optional; the usual plan, however, is to use clear varnish for the pattern, and black for core prints and the insides of core boxes, which thus distinguishes them. The black is made by adding the best dry ivory black to the clear varnish. A very durable varnish may be made by adding powdered oxide of iron to the clear varnish, which gives a hard varnish with a reddish brown color. In mixing colored varnishes, however, we must remember that the lighter the pigment, the easier they work. Ivory black is the lightest pigment, and so always pervades the varnish, and does not readily settle to the bottom; hence it does not often require stirring. Oxide of iron requires frequent stirring, even in the course of varnishing one pattern, if it be a large one; because it settles so rapidly that a perceptible difference in the coat is apparent unless the varnish is stirred previously to each insertion of the brush. The brush should never go to the bottom of the pot, and the pot should always be kept covered when not in actual use. Varnishing lathe work cannot be done while running the lathe; but after the work is varnished, running the latter hastens the drying. Work should always, if possible, be varnished on a dry day; for if the air is damp, the varnish becomes what is technically termed chilled, that is, it assumes a soapy or milky appearance, as though it had absorbed water, and hence is spotty when dry.

Having thus finished our example, we may now explain the process of putting pins in patterns, which we omitted to do, when speaking upon that subject, to avoid digression. There are many cases in which it is not suitable for the pin hole to show on the outside of the pattern; and again, in large work, the holes would require to be bored so deep and the pins made so long that it would be too elaborate an affair altogether. In such circumstances, lines are resorted to, being drawn in the following manner: Place the pieces side by side, with the planed edges touching and the ends fair, as shown in Fig. 105, the line, G, representing the edges; and make two fine notches at A B. Then separate the pieces,

Fig. 105.



and square the very fine lines, C C, D D, across with aknife. Then set a gage to half the width of the pieces, and mark the intersecting lines, E F; and the centers for the respective pin holes will be the intersection of the lines, C E and D F. If, however, we have no planed edge to work from, and the job is of such size as to involve so much labor as not to admit of planing, we may take two small brads or finishing nails (or as many as we desire to have pins), and drive them almost entirely into one piece of the wood in the spots where the pins are ultimately to be, and then file the projecting part of each to a point. By then resting the other half in its proper relative position upon the filed points, and, when adjusted, applying a little pressure to it, the nail points will enter the top piece and mark the corresponding centers for the holes to receive the pins. We may then extract the brads or nails, and proceed to bore the holes and insert the pins.

IMPROVED RIBBED BALE TIE.

We illustrate herewith a new and very simple tie for cotton and hay bales, etc., which is quickly adjustable, and is claimed to allow of no expansion of the bale after it is secured. This is an important consideration, as the bales always expand several inches in thickness after leaving the press, and, through their bulk, cost more for freight and storage than would be the case did the bands hold them in the shape given by the pressing. In Fig. 1 the tie is shown applied, and in Fig. 2 it is represented on a large scale. The novel feature consists in making slightly raised ribs on the band, at something less than an inch apart. The buckle is a mere frame with a crossbar, A. The band is applied ribs inward, and the end is inserted through the buckle, as shown in Fig. 2, and under the part to which the buckle is attached. The crossbar, A, and front part of the buckle are suitably beveled to enable the end to be easily inserted and fastened without bending the band. The ribs, being formed along the entire length of the band, enable it to be adjusted to any size of bale. The employment of the device in no way damages it, so that it may be repeatedly used.

This bale tie is in use by many of the largest cotton-packing firms in the South, among whom are Hadden & Avery, Memphis, Tenn., Dunn, Ogletree & Co., Atlanta, Ga., and Woodruff & North, Selma, Ala.

Patented July 11 and 25, 1876. For further particulars address the manufacturers, Messrs. P. Hayden & Son, Columbus, Ohio.

Fig.1

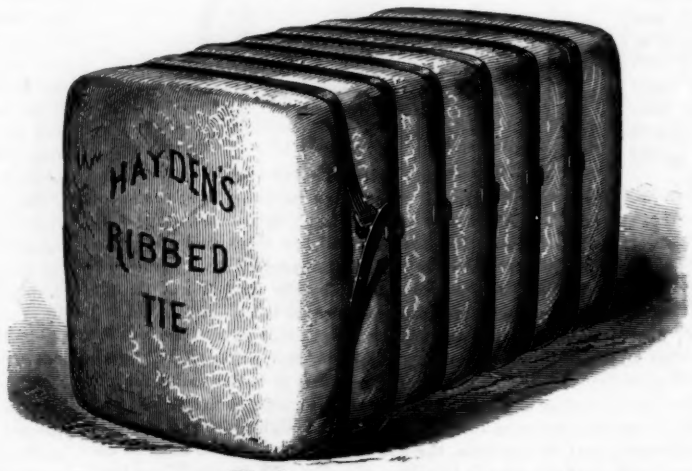
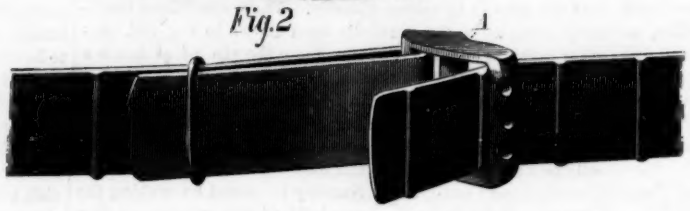


Fig.2



HAYDEN'S RIBBED BALE TIE.

Ozone Produced by Waves and Fountains.

The mechanical action of pure air over vegetation is productive of ozone, but still more manifestly is this subtle quality produced by the dashing of waves and spray against the air. These lashings of air and sea mixed are, electrically speaking, in the nature of one substance rubbing on another. They evoke ozone, which, being inhaled in breathing, gives a stimulus to the constitution. Hence the benefit to health from a sea voyage, or a residence at a pleasant seaside resort. Mr. Binney stated, at a recent meeting of the Manchester (England) Literary and Philosophical Society, that the atmosphere of towns may be sensibly ozonized, and of course improved in quality, by the action of public fountains. He says: "A water fountain may be regarded as a hydro-electric machine, the friction of the water issuing through the jets developing electric action, materially assisted by the conversion of the spray into aqueous vapor. I would suggest that this fact should be prominently brought before municipal bodies, to induce them to erect fountains in all available places in large cities, as sanitary agents. They might prove highly beneficial in crowded localities."

THE CAMACHO ELECTRO-MAGNETIC ENGINE.

The following description, with the diagrams annexed, from the *English Mechanic*, will enable the reader to obtain a tolerably correct idea of the new electro-magnetic engine patented by M. José S. Camache, of Paris, and which has attracted considerable attention from students of electricity and motive power. The invention consists mainly in the employment of an improved armature and the arrangement of the commutator, by means of which the speed and power of the engine can be varied; but M. Camacho claims the use of tubular magnets for the purpose, as well as his improved armatures and commutators.

The new engine may be constructed according to two modifications, the electro-magnets being stationary, and the armatures movable, or *vice versâ*. In both cases the principle of the apparatus remains the same, the details only of the engine being varied. The armatures are formed of metallic plates insulated magnetically from one another, in order to cause the engine to generate a greater amount of force. The magnetic inertia of a temporary magnetic is so much greater in proportion as the volume or mass is increased; consequently a comparatively long time is required for it to attain its maximum of magnetization if the mass is considerable. Moreover, in the case in question, and when the armature is placed in proximity to the magnet, it has a tendency to become magnetized throughout its whole extent. It should further be observed that the nearest part of the magnet (which is alone effective) cannot attain its maximum amount of magnetization except at the same time as the whole of the armature—that is to say, when the latter has arrived opposite the magnet. Now it is precisely at this instant that, in rotatory electro-magnetic engines, the passage of the current, which produces the attraction, would cease; whence it results that the armature has finished its course or travel without attaining its maximum of magnetization; and consequently a great diminution of the force, which would otherwise be produced by the engine, ensues. In order to remedy these defects, the armatures of M. Camacho's electro-magnets are composed of a suitable number of metallic plates or blades, arranged normally at the acting surface of the electro-magnets, and magnetically insulated from one another by the interposition of any suitable substance which forms a bad conductor—such, for example, as paper, resin, and the like, and even certain metals which form bad conductors of magnetism. "In this manner the magnetization is produced successively in each of the plates of which the armature is composed, which, in consequence of their small volume, are thus brought to a condition of maximum magnetization as soon as they come within the range of magnetism of one of the electro-magnets of the engine, and the travel of the armature is completed in maximum magnetization, giving greater production of force with the same expenditure of electricity. As this effective force is the product of forces multiplied by velocities, it is also evident that an increase in the effective force is produced by reason of the greater rapidity of the magnetization and demagnetization of the armatures formed of insulated plates or blades."

In the new commutator the piece of metal or contact maker, serving as a conductor, instead of being made rectangular in shape, is constructed in the form of a trapezium or triangle, so that the rubber which acts against it continues in contact therewith, during only a fraction of a revolution, varying according to the position in which the contact maker is placed. It will thus be seen that it suffices to advance or draw back the commutator upon its axis of rotation, while the rubbing surfaces of the engine remain stationary in order to modify the passage of the currents in the electro-magnets, and consequently to regulate the speed and power of the engine.

FIG. 1.

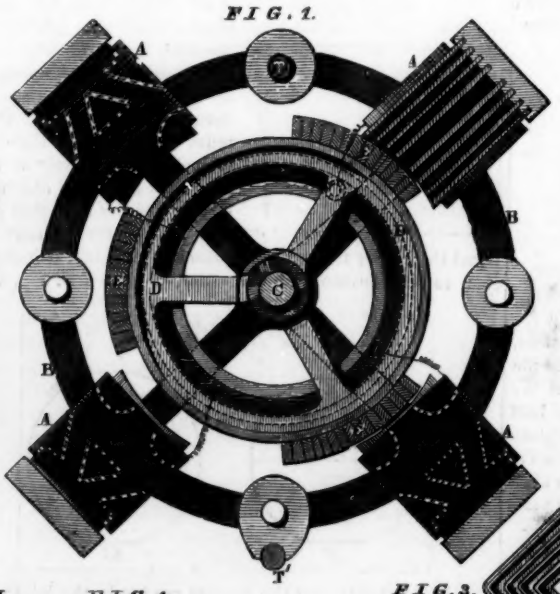


FIG. 2.

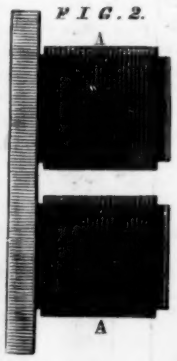


FIG. 5.

FIG. 4.

FIG. 3.

THE CAMACHO ELECTRO-MAGNETIC ENGINE.

In the diagrams, Fig. 1 is a transverse section of a rotary electro-magnetic engine, in which the electro-magnets are fixed or stationary, and the armatures are movable; Fig. 2 is an elevation of one of the electro-magnets, and Fig. 3 a horizontal section of one limb of a magnet, a longitudinal section being shown in Fig. 1; Figs. 4 and 5 show the improved commutator.

The electro-magnets, A (shown detached in Fig. 2) are four in number, and fixed at equal distances apart from one another between two disks, B, serving as a frame and support to the whole of the apparatus. (One disk only is shown in the figure.) The movable part of the engine is composed of a shaft or axis, C, upon which are fastened recessed or hollow disks, D, to which the armatures, E, are attached. These armatures in the present example are three in number, and they are formed, as before mentioned, of a series of plates or blades of metal insulated electrically from one another and arranged in parallel or radiating positions, as shown in the engraving. The shaft, C, also carries the commutator (F, Figs. 4 and 5), in contact with which roll four rollers, each of which is in communication with one of the electro-magnets, A. The current enters the apparatus by a binding screw attached to the frame or disk, B, passes thence into the shaft, C, and into the commutator, F, whence it reaches the rollers, which direct it successively to each of the electro-magnets, A, by the intervention of binding screws insulated from the frame, and fixed on a disk of wood or other insulating material. The current issuing from the electro-magnets passes to binding screws attached to a metallic ring, which unites them all, and which is insulated from the frame by a disk of wood or other suitable material; the current then passes off by a binding screw to return to the battery. The positions of the binding screws on the metallic ring are shown in dotted lines.

An ordinary commutator may be used, but M. Camacho prefers the improved commutator, F, shown separately in Figs. 4 and 5, which is provided with triangular contact makers, admitting of the duration of the passage of the current being varied or regulated in each electro magnet, according to the position given to these contact makers relatively to the friction rollers before spoken of. The adjustment is effected by causing the commutator to slide along parallel with itself upon the shaft, C, and when in the required position is held by the set screw. The blades of the armature, which are magnetically insulated from one another, as shown in Fig. 1, may be made of a triangular or trapezoidal form in section; but as previously stated, for the sake of greater simplicity the armatures may consist of any suitable number of metal blades with parallel faces arranged in juxtaposition, but magnetically insulated from one another by any suitable means. The electro-magnets employed in the engine are by preference constructed of tubes of a cylindrical rectangular, square, or other convenient section, an example of which is shown in Fig. 3; but ordinary electro magnets with solid cores may be employed, arranged in any required number round the apparatus.

The engine may be constructed of any dimensions. Bars or bolts are shown at T, Fig. 1, for the purpose of securing it either to a fixed framework or to the object itself, to which it is to impart motion. It is applicable, says the inventor, to industrial purposes generally, such as driving sewing machines, working musical instruments, machine tools, and the like. It may also be employed, by constructing it of suitable dimensions, for the hauling of vehicles upon rails or upon the ground, as well as propelling vessels, or for imparting motion to other apparatus.

Coast Lights Injured by Birds.

It is a curious fact that, during the months of April and October, keepers of lighthouses along the coast are obliged to exercise the greatest vigilance in order to prevent injury to their lights through the breaking of the lantern glasses by birds flying against them at night. Ducks often dash against the panes with such force as to shatter heavy plate glass, and even wire netting, now used, is sometimes found an inadequate protection. The keeper of the new light near St. Augustine, Fla., states that almost every morning during last month he picked up from twenty to fifty dead birds, which had committed involuntary suicide in the above manner. It is estimated that at each of the large lighthouses on the coast some 2,000 birds are thus yearly slaughtered, or in all about 100,000 annually. The circumstances also serve to indicate that the flight of the birds, which migrate during the months named, is accomplished in the night.

VARNISH FOR SILVERWARE.—Gum elemi, 30 parts; white amber, 45; charcoal, 30; spirits of turpentine, 375. It must be used in a heated state, the metal to which it is to be applied being also heated.

THE GRINDSTONE COLUMN AT THE CENTENNIAL.

It would hardly be imagined that such homely objects as grindstones could be grouped tastefully and even elegantly, and yet an enterprising manufacturer of these useful articles (Mr. J. E. Mitchell, 310 York avenue, Philadelphia) exhibits his productions at the Centennial Exposition in so artistic a manner as to challenge universal admiration. From the center of his allotted space, which is located on the southern main passage in Machinery Hall and near the Corliss engine, rises a superb Tuscan column, twenty-six feet high. This is composed of thirty-six grindstones of different grits and qualities, piled one above the other. Slight variations in diameter of the stones produce the graceful swelling outline of the pillar; and their different colors, ranging from red to bluish, gray, and yellow, are harmoniously combined to produce the effect of tinted bands. The general appearance of the column is shown in the annexed engraving, and it forms one of the most prominent objects in the vast display.

Mr. Mitchell's exhibit is not merely artistically attractive, but is also one of those sensibly arranged contributions from which any one, studying them, can obtain, by simple inspection, a fund of useful knowledge. For instance, there is a collection of mounted grindstones from which the machinist may learn all the different modes of adjusting the stone, and make valuable comparisons. He may also see all the various kinds of stones, and thus note the differences in grit, and determine which is best for his own especial purpose. There are huge stones weighing from 1,000 to 4,000 lbs. each, such as are used for grinding saws, files, edgetools, and cutlery, for beadstones in nail works, and for finishing the iron work of locomotives. Thence downward, every size of stone may be examined, to the smallest made.

Three medals have been awarded to Mr. Mitchell for this exhibit. A very interesting pamphlet, on the subject of grindstones, their history, and how to hang and use them, may be had free by addressing the manufacturer above named.

MITCHELL'S GRINDSTONE EXHIBIT.

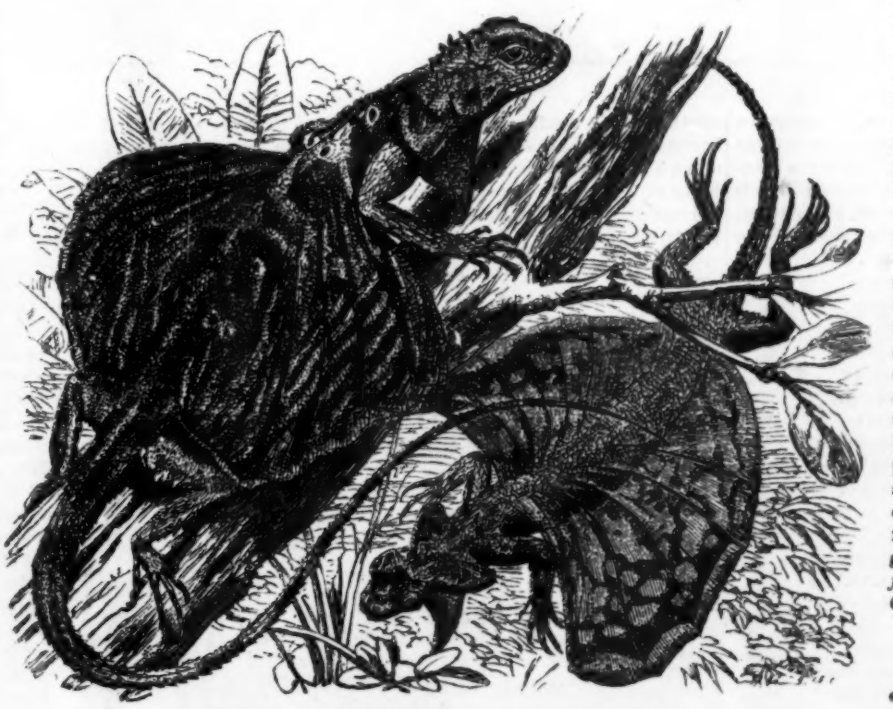
The Physical Properties of Gallium.

M. Lecoq de Boisbaudran, in a recent note to the French Academy of Sciences, states that he has prepared about 7½ grains of gallium. In liquid state, the metal is a beautiful silvery white; but in crystallizing it turns blue, and its brilliancy becomes greatly diminished. The point of fusion is fixed, for the metal melts very slowly at 86.27° Fah., and crystallizes very slowly at 86·09°. The density of the specimen is 5·935. Gallium crystallized under water crepitates sometimes on heating.

FLYING LIZARDS.

The remarkable lizards of our Western hemisphere, properly termed the iguanas, have their counterparts in the agama family of the East. The tribe contains between thirty andforty genera, and many of them are peculiar and interesting. Our engraving represents, first, the fringed dragon (*draco fimbriatus*), which is commonly found in Sumatra. The head is grayish white, covered with an irregular network of dark brown, and on the throat are a number of circular specks covered with granular scales. Upon the under parts of the male, the scales are rather large and keeled: and upon the wings are a number of rather short, white dashes of a partly triangular shape. Along the sides run series of small triangular keeled scales.

The other specimen shown in our illustration is also a so-called flying lizard, called the flying dragon (*draco volans*. It is a native of Borneo, Java, the Philippines, and the neighboring islands. The prominent characteristic of this reptile is the singular developed membranous lobe to be found on each side, which lobes are strengthened by certain slender processes from the six false ribs, and serve to support the animal during its bold leaps from branch to branch. The flying dragon is the most agile and daring of the winged lizards; and it can leap a distance of 30 paces, its so-called flight being similar to that of a flying squirrel or flying fish. The color of this reptile is variable, but is usually as follows: The upper surface is gray, with a tinge of olive, and daubed or mottled with brown. Several stripes of grayish white are sometimes seen on the wings, which are also ornamented with an angular network of dark blackish brown. When the dragon is at rest or even traversing the branches of trees, the parachutes lie in folds along the sides; but when it prepares to leap from one bough to another, it launches into the air and sails easily, with a slight fluttering of the wings. It makes itself more buoyant by inflating the three membranous sacks that depend from the throat. It has been commonly supposed that these animals gave rise to the fabled dragons of the ancient mythologies; but the probability is that the real clue to the origin of the monster is to be found in the gigantic saurians of ancient times, which were found on earth for some time after man made his appearance on the planet. We select the engraving from Wood's "Illustrated Natural History."



FRINGED DRAGON AND FLYING DRAGON.

Fall of a Meteorite in Kansas City.

Mr. J. D. Parker, in a letter to the *American Journal of Science*, says: "On June 25, 1876, between the hours of nine and ten in the morning, a small meteorite fell upon the tin roof of Mr. Isaac Whittaker's business house, No. 556 Main street, Kansas City, Mo. The meteorite came down with sufficient force to cut a hole in the tin roof on the front part of the house near an open window; but not passing entirely through the tin, it bounded back a few feet and lay on the roof. Mrs. Baker, who occupies rooms in the front part of the house in the second story, and Mrs. Whittaker were standing near the window when the meteorite fell, and heard the sharp concussion when it struck the roof. Mrs. Baker immediately picked up the meteorite as it lay near her on the roof, but dropped it again, finding it too hot to retain in her hand.

"The meteorite is a plano-convex specimen, about 1¼ inches in diameter, and about ¼ of an inch in thickness. The outside or convex surface possesses the usual crusted appearance, while the inside or plane surface differs from ordinary meteorites in possessing the appearance of sulphuret of iron, subjected to some degree of heat, instead of nickeliferous iron. One might easily infer that the meteorite was scaled off from a large bolide that passed over the city at that time. As it fell in the city, I have named it the Kansas City meteorite. It has not been subjected to chemical analysis."

Growth of the Earth.

"Since meteoric matter is continually falling upon the earth, she must of course be growing larger, and the daily number of meteors is so immense that it would be natural to suppose that the increase might be quite appreciable in a few centuries. It is not so, however: the surface of the earth is so enormous, compared with the quantity of meteoric matter, that, even on the most favorable hypotheses, her diameter would grow only about an inch in five hundred million years by accessions of this kind. A few figures will make this clear.

"As to the number of visible meteors, there is substantial agreement among authorities. The estimate of Professor Newton is as large as that of any one, I believe, and he puts it at 7,500,000 *per diem*, which number we will use. As to their average weight there is more difference of opinion. Probably, however, the most careful and best founded investigation is that of Professor Harkness, published in his report upon observations of the November meteors of 1866; and his conclusion is that 'the mass of ordinary shooting stars does not differ greatly from one grain.' Professor Newcomb appears also to concur in this estimate. There are reasons, which it would take too long to discuss, for thinking that this value is likely to be somewhat too small; but on the other hand it is almost absolutely certain that the average mass cannot be as great as one fourth of an ounce. To be on the safe side, we will assume 100 grains as the mean weight of the visible shooting stars.

"Remembering that the pound is 7,000 grains, we shall then find nearly 107,000 pounds, or about 50 tuns, for the total weight of one day's supply of shooting stars. An allowance must also be made for the meteors too small to be visible (which are known by telescopic observations to be very numerous), and for the matter brought down by aerolites. If we double the quantity stated above we shall certainly be abundantly liberal, and this will give us 214,000 lbs. a day, or about 78,164,000 lbs. per year, as the earth's rate of grow h in weight.

"Her increase of bulk depends upon the density of the meteoric matter, and probably this density does not differ much from that of ordinary soil, or nearly three times that of water. If so, each cubic foot would weigh about 187½ lbs., and the annual meteoric accession to the bulk of the earth would be not far from 417,000 cubic feet. A cube about 75 feet on each side would be a little larger. It would take more than four millions such to make a pile as large as Mount Washington. Now, since the surface of the earth is about 5,484 millions of millions of square feet, it follows that the annual supply of meteoric matter, if spread uniformly, would form a layer whose thickness would be only $\frac{1}{131,000,000}$ a foot, or very nearly $\frac{1}{11,000,000}$ of an inch. In other words, even on such extravagantly favorable hypotheses as we have assumed, the formation of a sheet of meteoric matter covering the earth to a depth of 1 inch would require a period of eleven hundred millions of years.

"If we suppose meteoric matter to have been just as abundant in space as now, since the beginning of time, and that the velocity of the earth's orbital motion has remained unchanged, and that the effects of her atmosphere and of her gradual shrinkage under the action of gravity can be neglected, then it can be shown by an easy course of reasoning, which would, however, hardly suit these columns, that her diameter must have grown during her whole existence at the same uniform rate as now, and we find that to build her up to her present dimensions by such a process of aggregation must have taken a period of at least twenty-seven and a half millions of millions of years.

"It is not intended to assert, however, that the earth was really formed in this way; and even if it was, the above estimate is of little value except as indicating the order of magnitude involved; since there is no certainty whatever—not even a probability—that in the early stages of the formation of the planetary system circumstances nearly enough resembled the present to warrant any conclusion. Nor must it be forgotten that the more probable estimates of Harkness and others as to the weight of meteors would lengthen all the periods of time mentioned from ten to one hundred fold. We have given the smallest values possible."—*Professor C. A. Young, in Boston Journal of Chemistry.*

A Severe Hurricane.

A cyclone of remarkable severity passed over the Central American states during October. The town of Managua, in Nicaragua, was inundated; four hundred houses were blown down, and damaged to the amount of $2,000,000. In Blewfield, on the Mosquito coast, three hundred houses were destroyed, and the coffee crops over an immense district were utterly ruined. Twenty lives were lost, and several vessels on Lake Nicaragua were sunk by the disaster. The total damage is estimated at an amount of over five million dollars.

HYDROSTATIC APPARATUS.

The hydrostatic or hydraulic press is a machine in which the pressure of a piston, on a body of water of relatively small sectional area, is made to propagate the force to a cylinder of multiple area, where the force is directly and the speed inversely as the difference. We extract from Knight's "Mechanical Dictionary"* the annexed engravings of a large variety of apparatus based on the same principles. A

HYDROSTATIC PRESS PUMP

is represented at A, in Fig. 1. *q* is the water cistern, and *r* is the pump barrel, which has a sucking tube, *t*, and a conical valve, *s*. The plunger is operated by the lever, which may be adjusted so as to give greater or less rapidity of stroke. *k* is a safety valve, and *z* the discharge valve. On lifting the plunger, water is drawn into the barrel, *r*, through the tube, *t*, and by depressing it the water is forced out through the pipe, *j*, the valve, *z*, rising to permit its passage. B, same engraving, is an

HYDRAULIC INDICATOR

or gage, used to indicate hydraulic pressure. Water, under the pressure to be tested, is admitted through the pipe, *a*, to a cylinder inclosing a piston, which tends to depress the short arm of the lever, *b*, counterbalanced by the weight, *c*. A movable weight slides on the long arm of the lever, and weights, *d*, are added to its outer end when a very great pressure is to be measured. An

HYDRAULIC PULLING JACK

is represented at C. A cylinder, *a*, contains a tube, *b*, to which the piston, *c*, is attached. *d* is a smaller tube sliding within the piston and tube, *b*. A valve, *e*, closes the communication between the cistern, *f*, which contains a pump, *f'*, operated by the hand lever, *h*, and the cylinder, *a*. Two passages, *g g*, afford communication between the tube, *d*, and cylinder, *a*, at the back of the piston, *c*. Water is poured into the cistern, and the jack is suspended, cistern end downward. Working the hand lever forces, by means of the plunger, *h*, water through the tube, *d*, and passages, *i i*, and depresses the piston to the bottom of the cylinder, *a*. The water at the back of the piston returns at the same time to the cistern through the passages, *g*. On unscrewing the stop valve, *e*, the water returns through the tube and passages, *i i*, to the cistern, relieving the piston from pressure and allowing a suspended weight to fall. D is a

BOOK PRESS.

It is arranged with either one or two pumps for forcing water into the lifting cylinder, the piston of which raises the platform on which the printed sheets are placed. This is kept in horizontal position by upright standards, and between it and the head of the press the sheets are compressed. At E and F are shown a

HYDRAULIC RAIL BENDER AND SHAFT STRAIGHTENER.

In the first of these, the action of the lever, *a*, operates a small force pump within the casing, which is connected with a larger cylinder, the piston of which forces the plunger against the rail, midway between the points where it is held by the lips, *c c*. In the shaft straightener, F, the beam, *a*, and shaft, *b*, are each inserted within the collars, *c*, and pressure is applied through the plunger, *d*, operated by a small hydraulic press, inclosed within the casing, *e*, and worked by the lever, *f*. G is an

HYDRAULIC PUNCH,

which comprises a force pump and operating cylinder, in which the piston carrying the punch, *b*, is inserted, inclosed in a case, *a*. The lever, *c*, operates the pump to depress the piston and to force the punch through a plate beneath; it is then raised by the lever, *d*, to punch another hole. H is a

JUICE PRESS,

used for the extraction of liquids from the more solid saturated portions. In this a horizontal plunger, *a*, actuated by a screw, *b*, works in a water chamber, *c d*, to raise a ram, *e*. A vertical screw, *f*, works in the head, *g*, on the standards, for raising or depressing the piston, between which and the ram, *e*, substances are compressed. I is the

HYDROSTATIC BELLOWS.

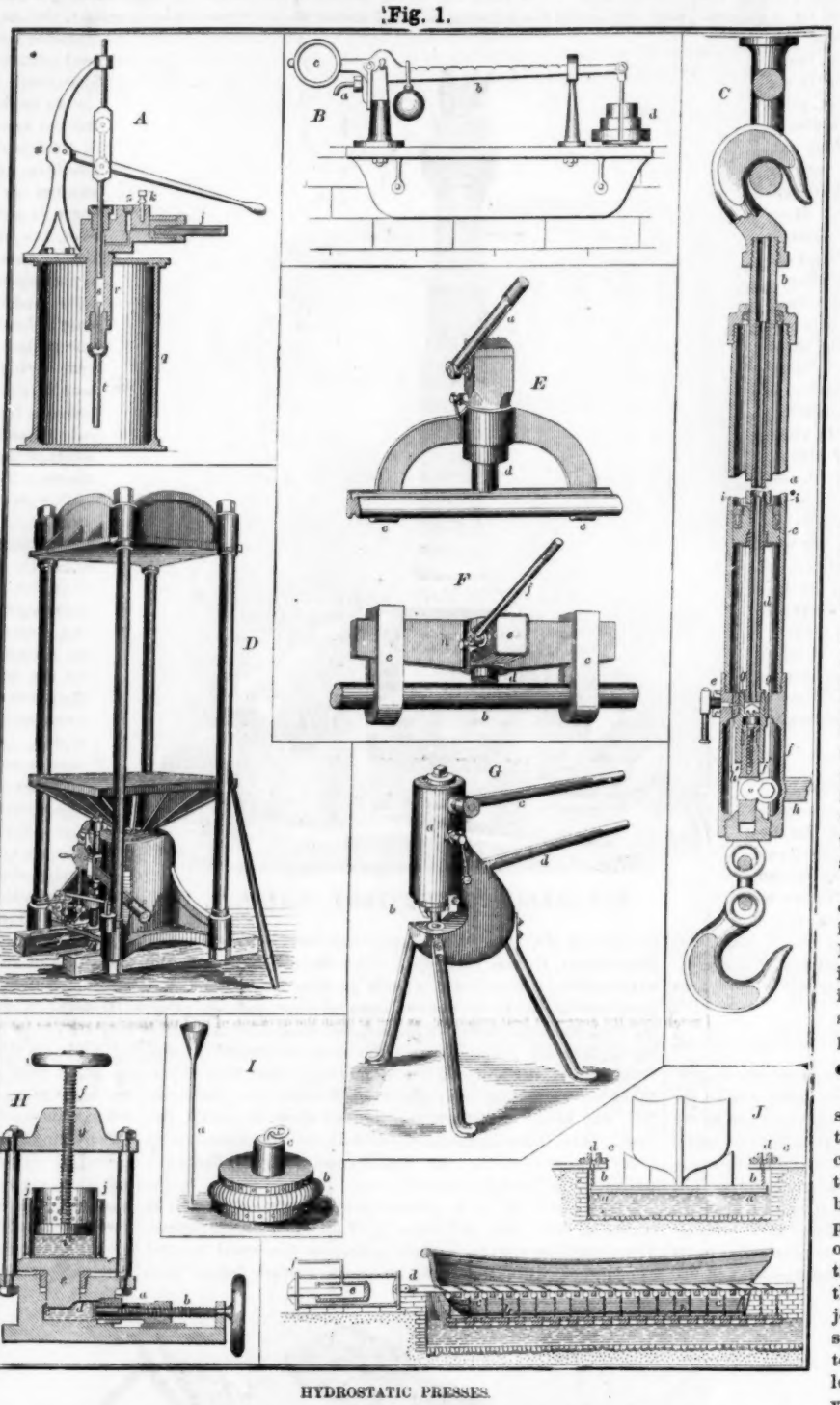
Water poured into the funnel-mouthed tube, *a*, flows into the flexible-sided box, *b*, and raises a weight many times greater than its own. The weight may be lifted in this way until its combined pressure and that of the column of water in the bellows, *b*, is equal to that of a column of water having an equal surface and as high as the column in the tube, *c*. At J is represented a

HYDRAULIC DOCK,

by which a vessel is raised clear of the water for examination or repairs. The vessel is brought over a platform which is slung between the frames, being suspended by chains which pass over pulleys. The lower ends of the chains are attached to the platform, and they are fastened above to a horizontal wooden beam which communicates with the ram of an hydraulic engine. When the ram, which is placed in horizontal position, is moved, by the injection of water into the cast iron cylinder in which it works, the motion is communicated to the horizontal beam, and thence by the chains to the platform, so that the vessel is thus slowly raised. The engravings give both a longitudinal and an end view of the apparatus.

Another application of the hydraulic press is illustrated in Fig. 2. Here it is used in making metallic life boats in which one half of the boat is swaged at a time between dies. The engraving shows the disposition of the press clearly and needs no further description.

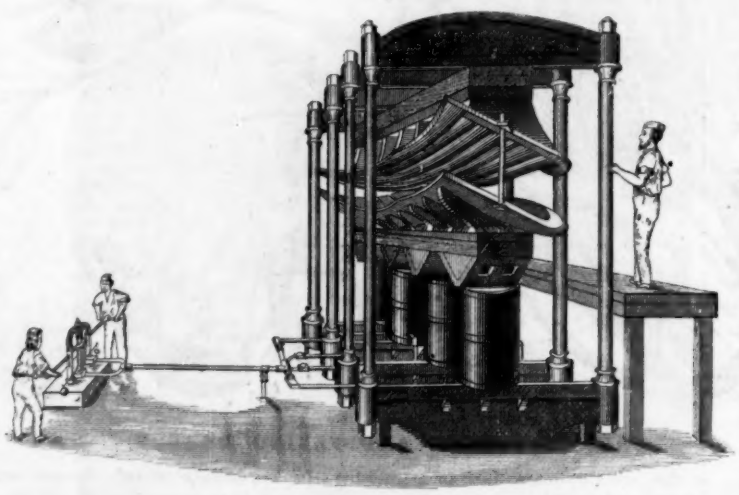
Fig. 1.



HYDROSTATIC PRESSES.

*Published in numbers, by Messrs. Hurd & Houghton, New York city.

Fig. 2.



Hydraulic Press.

Who Originated Electroplating?

In our recent obituary notice of Mr. Thomas Fearn, which we extracted from the Birmingham (England) *Gazette*, it was stated that he was the probable inventor of the electroplating process, the patent of which he sold to the Messrs. Elkington. Mr. T. Spencer writes to the *British Trade Journal* to deny this and to claim the invention for himself. He says:

"Those who wish to see the first electroplated article—as I suppose it to be—may have their curiosity gratified in the Liverpool Museum, in which there is an electroplated teaspoon with my initials engraved on it, and the date, May, 1838 This date, be it observed, is above two years in advance of that of the Elkingtons' patent. This spoon, though it was not in the legal sense sold, was thickly covered with silver, and given to my friend, Mr. Joseph Mayer, the eminent silversmith of Liverpool, on the day, as it happened, the date was engraved on it. Its history is briefly this: During my electro experiments, Mr. Mayer had frequently seen their results in copper, and naturally became desirous to know how far the art was applicable to the deposition of silver. So for this purpose he sent to me, at my request, a white metal teaspoon, and with it a flattened-out Mexican dollar to act as the opposing plate in the small galvanic arrangement I had then in use. Some fortnight after I took it to him, thickly coated with silver, but rough as it came from the trough. I remember it was weighed and found to be about ¼ oz. heavier than when it was received. The object in putting so much silver on was to test the adhesion of the one metal to the other.

"I suggested that the better mode of arriving at this would be to cut into it deeply with a graver, which Mr. Mayer had done accordingly, and on calling on him a few days after I was told it had stood the test I suggested. I then saw that he had got his engraver to put my initials on it, with the date."

Germination at Low Temperatures.

It has recently been discovered that seeds will germinate even if placed between blocks of ice. M. Haberlandt has conducted further investigations into this subject, and has kept a large number of different kinds of seeds at a temperature of 45°. In 23 days 8 species out of 22 showed distinct signs of germination, while others remained sterile to the end. M. Haberlandt plausably conjectures that those grains of any given species which will germinate at a lower temperature than others will require a less amount of heat for their perfect development; and thus by artificial sowing, a variety might perchance be obtained precocious in habit and needing little heat.

Chinese Immigration.

Last April the Senate of California appointed a commission to ascertain the condition of the Chinese in that State and the social, moral, and political effects of Chinese immigration. The commission began to take testimony in San Francisco, April 11, and in 15 days examined more than twenty Chinese and an equal number of whites. The examination related to marriage, the use of opium, labor contracts, the character and power of the Chinese companies, the condition of women, Chinese intelligence, their purpose in coming, the effect of such immigration in other countries, and the political consequences here, as well as the moral, social, and religious bearing of their presence. The evidence is almost unanimous that all who come are imported by Chinese companies; are the lowest of their race; aim only to earn five or six hundred dollars; are secretly banded; regard no oath or law they dislike; introduce incurable diseases; corrupt American youth; refuse to accept American education, and therefore can never be fitted for citizens. The testimony is long, and there is much repetition, but it substantiates the charges made against the Mongolians; and now that labor is such a drug that more or less which is desirable on every ground is returning to Europe, and European immigration is prevented, there is a stronger probability that whatever can be done will be, and earnest measures adopted to prevent the further influx of a population foreign to every interest as well as to every prejudice of the country.—*Bulletin of the Iron and Steel Association.*

CENTENNIAL NOTES.

THE REMINGTON BUTTON HOLE MACHINE.

Among the thousands of curious machines seen by the visitors to Machinery Hall, one of the most novel is the Remington button hole machine. Since the advent of the sewing machine, many attempts have been made to produce something that would make a button hole, and usually such efforts have been directed toward an attachment for an ordinary sewing machine. So far as known, such efforts (either as an attachment or a complete machine) have been attended with only partial success; and until the production of the Remington machine no device for completely finishing a button hole has been a perfect success. This machine is complete in itself, being about the size of an ordinary sewing machine, but is made upon entirely new principles The invention seems to be based upon the idea of a single thread as used in handmade work, forming a loop stitch exactly as made by hand, and which is concluded to be the only proper stitch for such work. A combined shuttle, bobbin, and needle is attached to the needle bar, resting in a socket in the latter. A hole of the required size is first cut in the material to be worked, then the latter is pushed upon a cone-shaped piece, and, by a movement of the operator's knee, is firmly clamped; and when once in position, it is automatically revolved around the cone, and does not require any manipulation to insure perfect work. The stitch is formed by a loop (taken from the needle after it has passed through the cloth) carried up and thrown over the shuttle and needle. When the cloth is taken from the machine, the button hole is found to be complete, the ends being strongly barred or stayed; and no handwork of any kind whatever is required.

The speed of this wonderful machine is from 1,800 to 2,000 holes in 9 hours' work: and judging by the rapidity and ease with which the work is handled, both by the machine and the operator, this large product seems easy of accomplishment. The range of work includes shirts, linen collars, knit goods, underwear, and many other classes of goods. The machine is simple in construction, durable, and not liable to get out of order.

A CORK WATER COOLER.

Cork, as is well known, is porous, and is a non-conductor of heat. These peculiarities have been taken advantage of in the manufacture of a water cooler made entirely of cork, which is displayed in the Spanish section, and represented below. It is made of a slab of the wood, bent round circular heads of the same and bound with brass hoops. The porosity of the cork allows the water to percolate slowly to the surface, and there to cool in evaporating, while its non-conducting nature prevents the heat of the sun warming the water within.

Spontaneous Fracture of Glass.

A SINGULAR ACCIDENT.—A light of glass, eight feet square, slightly marred by an accident, was removed for a new one on King street, in Troy, the other day, and placed against the side of a building. Suddenly the glass flew into a thousand pieces. One of the fragments struck a workman, and penetrated the right leg of his pantaloons, and cut a deep gash in his knee. No cause can be assigned for the singular explosion. It was accompanied by a loud noise, which was heard some distance away.—*American Architect and Building News.*

REMARKS: This occurrence was doubtless due to the imperfect annealing of the glass. The *British Journal of Photography* says, on the detection of bad glass:

"We have more than once experienced, and, doubtless, many of our readers have similarly suffered, the loss of a large glass vessel through the occurrence of a crack, produced no one could tell how; but when, on one occasion, an unusually thick vessel fell to pieces before our eyes, though it had not been touched or heated for some days, the cause became plain to us. The fracture and the cracking arose from the imperfect annealing of the glass, which remained whole till some unnoticed vibratory impulse caused sufficient molecular disturbance to allow the stronger of the unequal strains existing in the mass to assert itself, and, overcoming the cohesion of the whole, to produce a crack or a complete fracture, according to its strength. To guard against such accidents, a suggestion has been made, by G. Hagenbach in *Poggendorf's Annalen*, to examine all articles by polarized light, when, if a hidden flaw exist, its presence will be revealed by the occurrence of prismatic colors. He was led to this discovery by the examination of some fragments of two glasses which had suddenly cracked in the unexpected manner we speak of; they all showed prismatic colors."

DECISIONS OF THE COURTS.

Supreme Court of the United States.

PATENT REFRIGERATOR.—BROWN & SEAVY, APPELLANTS *vs.* ENOCH PIPER.

[In the matter of the appeal from the Circuit Court of the United States for the District of Massachusetts.—Decided October, 1875.]

Mr. Justice Swayne delivered the opinion of the Court.

The patent of E. Piper, March 19, 1861, held by the court to be anticipated by the ice-cream freezer.

The claim to "preserving fish or other articles in a close chamber by means of a freezing mixture, having no contact with the atmosphere of the preserving chamber, substantially as set forth," when taken in connection with explanations contained in the specification, construed to be for the application to articles to be preserved of the degree of cold necessary to preserve them, by means of a "close chamber," in which they are to be placed, and "a freezing mixture, having no communication with the atmosphere of the preserving chamber."

The application of an old process to a new subject without any exercise of the inventive faculty, and without the development of any idea which can be deemed new or original in the sense of the patent law, is not patentable.

United States Circuit Court—District of Massachusetts.

PATENT PRESSING MACHINE FOR TAILORS.—GRANTED JUNE 8, 1858.—LEVI B. STORES *vs.* PATRICK HOWE *et al.*

[In equity.—Before Clifford, J.—Decided September 2, 1876.]

In a suit for infringement of a patent the burden of proof is upon the plaintiff or complainant to show that the patentee was the first and original inventor of the improvement, and that the patent has been infringed by the party against whom the suit is brought.

The patent, if introduced in evidence, affords a *prima facie* presumption that the patentee is the original and first inventor, and, in the absence of proof to the contrary, is sufficient to entitle the party instituting the suit to recover for the alleged violation of his exclusive rights.

Equivalents are allowed in every class or description of inventions.

A combination of old ingredients is not infringed unless it appears that the alleged infringer made or used the entire combination.

Equivalents are such ingredients as will perform the same function as the one described, and which were well known at the date of the patent as proper substitute for the ones actually described in the patent.

Patent sustained.

[*Chas. H. Drew*, for complainant.
John S. Abbott, for defendants.]

United States Circuit Court—District of Massachusetts.

IRON-BRONZING PATENT.—HIRAM TUCKER *vs.* THE TUCKER MANUFACTURING COMPANY.

[In equity.—Before Clifford, J.—Decided September 1, 1876.]

Clifford, J.:

Inventors, if they desire to secure letters patent for their inventions, must apply to the Commissioner therefor, in writing, and the requirement is that they shall file in the Patent Office a written description of the invention, and of the manner and process of making, constructing, and using the same, in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it appertains to make, construct, and use the invention. (16 Stat. at Large, 201.)

Pursuant to that provision the complainant in this case applied in writing to the Commissioner for a patent, describing his invention as a new and improved process or method of superficially bronzing or coloring iron, as more fully set forth in the specification of the patent. Iron, he asserts, has heretofore been japanned by covering its surface with oily solutions of asphaltum and pigments, and by the subsequent application of heat sufficient to produce hardness; and he also admits that metals have been lacquered or bronzed by the application of a solution of resin and metallic powders or salts, dried by exposure to air or heat. Both of these operations, he admits, are old and well known. Instead of that, his invention, as he alleges, consists in a process of covering iron with a very thin coating of oil, and then subjecting it to heat, the effect of which is to leave upon the iron a firm film, which is very durable, and which gives the iron a highly ornamental appearance, like that of bronze. Exact and complete description is given in the specification of the steps to be taken in applying the process so as to effect the described result. Three directions of the kind are given as follows:

1. That the surface of the iron to be bronzed shall be cleansed from sand, scales, or other foreign matter, and where fine effects are desired the suggestion is that the surface should be polished or made smooth.

2. That the surface of the iron so prepared should be covered with a very thin coating of linseed oil, or some equivalent oil, and the suggestion of the patentee in that regard is that he attains such a coating by applying the oil with a brush, and then rubbing the oiled surface thoroughly with a rag, sponge, or other suitable implement.

3. That the iron so prepared and oiled should be placed in an oven and exposed to heat of an intensity sufficient to change a brightened surface of clean unoiled iron to a color varying from that of light straw to deep blue, until the required bronze color is developed upon the iron, the suggestion of the patentee being that the resultant shade of color will depend very much upon the degree of heat employed, as well as upon the duration of its application, which, in every case, may depend upon the skill, care, and judgment of the operator, both in the application of the oil and in regulating and determining the degree and duration of the heat. Boiled linseed oil is preferred by the patentee, and he directs that the iron, when the desired shade of bronzing is obtained, be removed from the oven or furnace; and he suggests that the process of oiling and heating may be repeated with profit if it be desired to deepen the shade of the bronzing, it being understood that the effect of each repetition will be to deepen the shade until the color becomes black. High heat, the patentee states, when applied to unoiled iron, will have the effect to produce upon the surface of the iron the series of colors pointed out in the specification, but he asserts that a thin coating of oil applied as directed before heating the iron has the effect to modify the oxidation and to produce a new and improved surface resembling bronze, and which is highly ornamental and of character to resist the effects of moisture and handling. Exhibits showing the practical results of the patented process were given in evidence at the final hearing, and they are abundantly sufficient to prove that the described steps are respectively essential to attain successful results, or, in other words, that it is essential that the surface of the iron should be cleansed from sand, scales, or other foreign matter, that the surface should be covered with linseed oil or its equivalent, unmixed with pigment, lacquer or japan, that the coating should be extremely thin, and that the iron thus prepared and oiled should be placed in an oven or furnace and be subjected to a high degree of heat.

Exact description of the invention is required to accomplish three great ends: 1. That the Government may know what they have granted and what will become public property when the term of the monopoly expires. 2. That licensed persons desiring to practise the invention may know, during the term, how to make, construct, and use the invention. 3. That other inventors may know what part of the field of invention is unoccupied. Sufficient appears to show that the description of the invention given in the specification constitutes a full compliance with those several requirements. Discussion of the title of the complainant is unnecessary; as it is admitted in the answer filed by the respondents, and the complainant alleges that the respondents have, since they have reassigned the patent to the complainant, infringed his exclusive right and privilege to make and use the invention and to vend the same to others to be used; and he prays for an account of all gains and profits realized by the respondents from the unlawful use of the same, together with the damages suffered by the complainant by reason of such unlawful use, and for an injunction.

Process was served, and the respondents appeared and filed an answer, in which they deny the charge of infringement and set up four other defenses: 1. That the reissued patent on which the suit is founded is not for the same invention as the original. 2. That the process described in the specification was not the subject-matter of invention at the time the original patent was granted. 3. That the complainant is not the original and first inventor of the described improvement. 4. That alleged invention was known to, and was used by, the persons named in the answer before the complainant applied for a patent. *

On the 15th of December, 1863, the original patent was granted to the complainant; on the 3d of March, 1865, he assigned the same to the respondents; on the 11th of September, 1866, the original patent was surrendered and was reissued to the respondents as the assignees of the complainant; the respondents, on the 27th of August, 1872, reassigned the invention as secured by the reissued patent to the complainant. Throughout that period, to wit, from the 3d of March, 1865, to the 27th of August, 1872, it appears that the respondents held the title to the invention as secured by the original and reissued patent, and it appears that they, during that time, manufactured quantities of goods by the process described in those patents, and that they paid royalties to the complainant for the right to use to process, and that throughout that whole period they acknowledged the validity of the patented invention.

None of those matters are in controversy, but the charge is that respondents, since they reassigned the patented invention to the complainant, having unlawfully continued to use the same without license, and have refused to pay any royalty to him for such, or to acknowledge his legal and just rights under the letters patent. Suffice it to say that the proofs fully establish that charge, and show that the respondents went immediately to work to see if they could not effect the same results as those accomplished by the patented process without infringing the same, and they now contend that they have been successful in their efforts. Instead of that, the court is of the opinion that they plainly infringed the patented process, that the attempt to avoid the charge of infringement is merely colorable, and that the complainant is clearly entitled to an account and to an injunction. *

[*Chauncey Smith, Walter Curtis*, and *Charles M. Reed*, for complainant.
George L. Roberts, for defendants.]

STITCHING HAT LININGS.—GLOVER SANFORD *et al. vs.* MERRIMAC HAT COMPANY.

[In equity.—Before Clifford, J.—Decided September 2, 1876.]

Clifford, J.:

Patentable inventions pertaining to machines may be divided into four classes: first, entire machines, as a car for a railway, or a sewing machine; second, separate devices of a machine, as the colter of a plow, or the divider of a reaping machine; third, new devices of a machine in combination with old elements, all embraced in one claim, or with separate claims for what is new, together with a claim for the new combination of all the elements; fourth, devices or elements of a machine in combination, where all the devices or elements are old.

What the assignor of the complainants professes to have invented is a new and useful improvement in sewing machines; and he states in the specification that the invention is designed for the purpose of stitching the sweats or leather linings into hats; and that the invention consists in the peculiar form of the work plate, with a guide for the sweat and a guide for the hat, combined with a sewing machine or stitching apparatus. *

The court is of the opinion that the invention consists of the work plate, the two guides, constructed and arranged as described, in combination with a sewing machine or stitching apparatus. Construed in that way, it is very clear that the respondents have not infringed the complainants' letters patent, as they do not use the guide for the hat. Where the invention consists entirely in a new combination of old elements or ingredients, the law is well settled that a suit for infringement cannot be maintained unless it appears that the respondent has used all of the elements or ingredients of the new combination. (Prouty *vs.* Ruggles, 14 Pet., 341; Vance *vs.* Campbell, 1 Black, 428; Gould *vs.* Rees, 15 Wall., 190. Seymour *vs.* Osborne, 11 Id., 555.)

Patents may doubtless be granted for a new device, and for the same in combination with old elements, and if both inventions are properly described and claimed, the patent will be valid for both; but it is not necessary to pursue that inquiry in this case, as the court is of the opinion that neither the description of the supposed improvement nor the claim of the patent in question brings the case before the court within that rule. Infringement not being proved, the bill of complaint must be dismissed.

Decree, that bill of complaint is dismissed.

[*Edward Avery*, for complainants.
Wm. W. Swan, for defendants.]

PATENT BILLIARD TABLE.—HUGH W. COLLENDER *vs.* JOHN E. CAME *et al.*

[In equity.—Before Clifford, J..—Decided September 2, 1876.]

A patent, in due form, was granted to the complainant on January 13, 1838, for a new and useful improvement in uniting comparatively hard substances to elastic foundations of billiard cushions, and that the same was surrendered on March 19, 1867, on account of a defective specification, and reissued to the same patentee for the same invention. Due application was subsequently made for an extension, and the record shows that the reissued patent was subsequently extended for the further term of seven years from the expiration of the first term. Gains and profits, it is charged, have been made by the respondents by infringing the exclusive right secured to the complainant by the said reissued patent, and he prays for an account and for an injunction. Process having been issued and service made, the respondents appeared and filed an answer. They deny that they have made, used, or sold cushions for billiard tables in accordance with the specification of the complainant's patent, or that they have made any gains or profits by infringing the exclusive right secured to him, as charged in the bill of complaint, and for defense upon the merits they allege the patentee is not the original and first inventor of the improvement, but that the same had been previously described in the specification of the foreign patent referred to in the answer, and that it was known to and had been used by the persons therein named, and at the places specified in the answer. *

The claim of the patent is:

An India rubber billiard cushion constructed with an imbedded spring band, having woven about it light and close-fitting fibrous casing or covering, as described, for the purpose specified.

Mechanical differences undoubtedly exist, but the general mode of constructing the two cushions is the same, as more fully appears by comparing the manufacture of the respondents with the machine of the complainant, as described in the specification of his patent. Compared in that way, the conclusion must be, in the opinion of the court, that the charge of infringement is satisfactorily proved.

Decree for an account and for an injunction.

[*James E. Maynadier*, for complainant.
George L. Roberts and *Reuben L. Roberts*, for defendants.]

NEW BOOKS AND PUBLICATIONS.

CHOKE BORE GUNS, AND HOW TO LOAD FOR ALL KINDS OF GAME. By W. W. Greener, Author of "Modern Breech Loaders." New York city: Cassell, Petter, and Galpin.

Mr. Greener, a well known gunmaker of Birmingham, England has introduced into that country the American practice of contracting the muzzles of fowling pieces, so as to deliver the pellets of shot in a compact mass, to ensure longer range and greater penetration. The system has met with great success there, not only in the field, but in shooting matches and in competitive trials. Mr. Greener has written an excellent handbook of the improved weapon; and he gives accounts of its proved efficiency which are conclusive and convincing. His remarks on the choice of a gun and care in its use are practical and sensible; and he gives our country full credit for the valuable invention which he has improved on and introduced into England. We recommend his book to all lovers of field sports.

AN ELEMENTARY HANDBOOK OF APPLIED MECHANICS. With Eighty-eight Diagrams. AN ELEMENTARY HANDBOOK OF THEORETICAL MECHANICS. With One Hundred and Forty-Five Diagrams. By William Rossiter, F.R.A.S., etc. Price 75 cents each. New York city: G. P. Putnam's Sons, Fourth avenue and 23d street.

Our readers have frequently read our criticism on the various numbers of Messrs. Putnam's two "Science Series," elementary and advanced. All the treatises selected for publication in this cheap and popular form are of the highest excellence; and the two now before us are full of condensed, intelligible, and accurate information, given to the reader in a strictly progressive and inductive manner. Books such as these are wanted to answer the demand for practical education, now so loudly heard in all our trades and handicrafts.

THE COMPENDIUM OF ARCHITECTURAL SHEET METAL WORK, with Rules and Directions for Estimates, etc. Price $10. Salem, Ohio: The Kittredge Cornice and Ornament Company.

This is one of the most elaborate trade handbooks we have ever seen. It contains over 530 pages of tables of proportions, dimensions, and prices of all kinds of ornamental metal work, and is lavishly illustrated with diagrams, etc. It is likely to be very useful to architects and builders employing sheet metal decorations. The Kittredge Company's price catalogue is distinct from the technical information and tables; and the latter afford means for ascertaining, by a simple plan of analysis, the complete and exact cost of every description of work.

THE TEXTILE COLORIST, No. 10, Volume II. Published Monthly. Subscription Price, $12 a year. New York city: John Wiley & Son, 15 Astor Place.

This valuable periodical maintains its high character as the standard authority on bleaching, dyeing, and printing textile fabrics. The complete volumes form handsome and elaborate treatises on the whole art and science of dyeing.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From September 5 to October 4, 1876, inclusive.

ABDOMINAL SUPPORT.—J. Heris, New York city.
AIR CURRENT.—J. Y. Smith (of Pittsburgh, Pa.), Leamington, England
AXLE AND BOX.—J. F. Pray *et al.*
CANCELING STAMPS, ETC.—T. G Palmer, Shultzville, N. Y.
CLOSING DOORS, ETC.—J. T. Foster, Jersey city, N. J.
FLUTING MACHINE.—A. Rose, New York city.
GLOVE.—W. F. Foster, New York city.
HOSIERY.—G. W. Gregory, Boston, Mass.
INSECT FAN.—S. W. Lambeth *et al.*, Philadelphia, Pa.
KNITTED FABRIC.—C. H. Landerberger, Philadelphia, Pa.
LEATHER-BEVELING TOOL.—J. Smith *et al.*, Boston, Mass.
LUBRICATOR.—T. Haynes, Kansas, Mo.
MAKING SUGAR.—D. M. Weston, Boston, Mass.
MINING MACHINERY.—P. Sheldon, Jamestown, N. Y.
PAPER BAG MACHINE.—G. H. Mallary, New York city.
PAPER BARREL, ETC.—W. H. Murphy, Syracuse, N. Y.
PAPER BARREL HEAD.—W. H. Murphy, Syracuse, N. Y.
PISTON PACKING.—Adair Packing Co., Bowling Green, Ky.
PRINTING AND CUTTING MACHINE.—W. Heckert, Providence, R. I.
PULP BOX MACHINE, ETC.—S. Wheeler, Albany, N. Y.
PURIFYING OIL, ETC.—G. W. Tilton, New York city.
RAILWAY SIGNAL.—F. W. Brierley, Philadelphia, Pa.
REDUCING ORES, ETC.—A. T. Hay, Burlington, Iowa.
REFRIGERATOR.—E. B. Smith, Albany, N. Y.
ROCK DRILL, ETC.—W. Weaver, Phœnixville, Pa.
SEWING LEATHER, ETC.—E. Drake, Stoughton, Mass., *et al.*
SEWING MACHINE.—J. Butcher, New York city.
SEWING MACHINE, ETC.—R. Whitehill, New York city.
SEWING MACHINE SHUTTLE.—J. Butcher, New York city.
SEWING MACHINERY.—J. Folk, Brooklyn, N. Y.
SPOOL-PRINTING MACHINE.—I. Dimock, Hartford, Conn.
STONE SAW, ETC.—R. S. Robertson, Pittsburgh, Pa.
STOVE, ETC.—J. J. Jarves (of Boston, Mass.), Florence, Italy, *et al.*
TEACHING SINGING.—G. N. Carrozzi, Chicago, Ill.
TIE BUCKLE.—H. W. Oliver, Jr., Pittsburgh, Pa.
TROUSER PROTECTOR.—J. H. Anderson, New York city.
VENTILATING SHIPS, ETC.—W. F. Thiers, New York city, *et al.*
WINDING YARN, ETC.—I. L. G. Rice *et al.*, Cambridge, Mass.

Recent American and Foreign Patents.

NEW MISCELLANEOUS INVENTIONS.

COMBINATION LAP RING.

George W. Atkins and James C. Harris, Noble's Lake, Ark.—This lap ring is formed of two parts, each of which has an opening at one side. The parts are secured together by rivets working in slats, so that one part may be slid or adjusted on the other. When they are adjusted in one position, the opening in the respective parts coincide; but when adjusted in another position, the openings do not coincide, and hence the ring is closed or becomes entire. This adjustment adapts the ring to be readily attached to or detached from chain links and singletree or doubletree hooks, etc.

IMPROVED WHIP.

Dexter Avery, Westfield, Mass.—The object here is to strengthen the whip at the joint, between the handle and stock, without increasing the cost of construction. The invention consists in a handle counterbored from its forward end to receive the end of the stock, and provided with a spike passing longitudinally through it from its lower end, and driven into the stock within said counterbore.

IMPROVED TRUSS.

Winfield A. Turner, Hiawatha, Kan., assignor to himself and J. F. Roehm, same place.—This is a pad made of a ball and adjustable socket tube, the pressure on the ball being regulated by a spring and set screw. The ball socket slides on a fixed socket of the base plate, and is secured by small set screws. A belt and thigh strap secure the truss in position on the body.

IMPROVED TRACE FASTENER.

Ephraim N. Banks, Wilkesbarre, Pa.—This consists of a socket having a deep ring groove formed around its outer end, and a notch formed in it at the side of said groove. There is also a hook having a circular head which fits into the groove of the socket. The hook can only be attached and detached by pressing the free end of a spring close against its side, to become detached accidentally.

IMPROVED PARLOR SKATE.

William Lockwood, Danville, Mo.—This relates to spring brakes for parlor skates, an attachment which has been heretofore used so as to bring the brake to bear upon the front wheel and connect it with a lever operated by the leg. The brake in the present case is a spring, from which a string extends down through a guide and up to the hand of the operator, in such manner that the brake is forced down on the wheel by pulling up the string.

IMPROVED HOOF EXPANDER.

Charles H. Shepard, Elizabeth, N. J.—This has reference to an improved device for preventing and curing contraction of the hoofs of horses or mules, and consists of a V-shaped spring having inner opposite rings and projections, the whole secured by suitable devices to the interior of the hoof.

IMPROVED HARNESS SADDLE AND SADDLE TREE.

Samuel E. Tompkins, Sing Sing, N. Y.—The first invention consists of a rib formed on the ends of the tree plate to make a finish at the ends of the flap or top leather, the said rib being raised up in the construction of the plate. The upper surface of the leather is flush with the top of the rib, and is made in concave form to facilitate the finishing of it with a file and to furnish room for the back band. The second invention is a saddle-tree plate, having a bridge for the terret screw, constructed with jogs or shoulders only, or the same and a bar. These are connected at the upper side of the bridge to support the flap against downward strain. There is also a flap, made solid the entire breadth of the tree above the bridge, and having support against downward strain by shoulders.

IMPROVED BELLY PIPE NOZZLE FOR BLAST FURNACES.

Sigismund F. Vielhaber, Consbohocken, Pa.—This consists in a double walled nozzle made with a flaring inner end, and provided with a ring partition at the base of its flaring inner end, having two holes formed through it. Said apertures correspond with the holes in the outer end, in which the inlet and outlet pipes are inserted. There are two longitudinal partitions in the straight part, midway between the inlet and outlet pipes. There is a circulation of the water through the space in the flaring end of the nozzle, and said end causes the blast to enter the lower part of the furnace in every direction, so that there will be no dead places.

IMPROVED POCKET BOOK LOCK.

Ernst Schnopp, East New York, N. Y.—This lock may be opened and closed by direct pressure. It consists of fulcrumed and spring-acted jaw levers that are operated by a top plate, which has a conical lug, entering recesses of the jaw levers, so as to release the knob on the flap part of the lock.

IMPROVED TOY CARRIER.

John H. Adamson, Clifton, N. J.—This is a weighted carrier running by a pulley over a tight rope, and provided above the pulley and rope with a suitable spring clamping device, to which toy figures are attached.

IMPROVED SCALE BEAM.

Edward A. Rock, Ludlow, Vt.—In these weighing scales, the beam and weight stem are so constructed that no obstruction will be offered to the eye upon the sides of the beam to prevent the position of the indicator from being readily seen. The scale beam is slotted longitudinally to receive the stem of the weight, and there is a T indicator, the knife edges of the arms of which rest upon the notched upper edges of the beam.

IMPROVED SACK FILLER AND PACKER.

Edward M. Whitney, Batavia, N. Y.—This consists of a follower valve in the spout of a funnel, containing flour to be packed, which is made to rise up and let the flour descend into the sack, the mouth of which is attached to the funnel. The valve then closes over and presses down the desired quantity of flour into the sack, shutting the spout against the further escape of the flour while the filled sack is removed and an empty one put on. The contrivance is such that the quantity of flour can be varied at will for sacks of different sizes. The invention also comprises an adjustable platform for holding the bags when filling and pressing.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED DUMPING CAR.

Eugene Davis, Clinton, Ill.—This has reference to certain improvements in car-unloading apparatus in which a tilting track section is used in connection with a main track for running a car on and off said section. The invention consists in the combination, with a centrally pivoted track section, of a segmental rack bar engaging with a spur wheel on a driving shaft. By the arrangement of the rack bar below the axis of the tilting track section, the same can be depressed at either end by simply turning the operating gearing in opposite directions, thus dispensing with two sets of devices for tilting the track.

IMPROVED WINDOW BEAD FASTENER.

Hiram W. Stetson, Black Brook, N. Y.—This consists of a metallic fastening plate, having a key hole slot that is secured to a detachable strip or bead and connected to the window frame by a fixed screw. By tightening or loosening the fastening screws, the putting on or removing of the beads or strips is facilitated, while, at the same time, the reliable fastening of the beads to the window frame is obtained.

IMPROVED WOOD-PLANING MACHINE.

Andrew M. Mortimer, Salt Lake City, Utah Ter.—This machine has novel mechanism, which operates in such a way that a board, after being passed through the machine and being planed upon one side, may be raised, passed back, or returned through the machine and planed upon the other side.

IMPROVED DUMPING WAGON.

Francis M. Pennebaker and William F. Pennebaker, Pleasant Hill, Ky.—This consists of the combination, with the box contrived to slide back on the wagon bed and tilt down behind for dumping, of a windlass under the driver's seat, and cords so connected with the box that it can be run out and allowed to dump, and drawn back.

IMPROVED COMBINED STEP AND HUB BAND.

Robert McDonald, Georgetown, Col.—This is a step, hub band, nut, and dust box combined in a single casting or piece of metal, or made in several parts, permanently fixed together. It provides a step at the desirable point and answers the purpose of a nut and hub band.

IMPROVED SINGLETREE.

Louis Flatau, Pittsburg, Tex.—This singletree has near each end a circular groove, and thence, running to the end, a longitudinal groove. With this construction, the trace rings cannot become accidentally detached, and can only be taken off by slipping the link into the longitudinal groove, and then slipping the ring off.

NEW HOUSEHOLD INVENTIONS.

IMPROVED MIRROR.

Ludger T. Berton, Paris, France, assignor to Pierre Leopold Brot, of same place.—This is a compound mirror, formed of a main glass having a frame, within which are hinged, on opposite sides, two other glasses, to fold within said frame.

IMPROVED FOLDING CHAIR.

Frank F. Parker, Gardner, Mass.—This folding chair has arms extending from the back to the upper ends of the front legs, to which they are connected by links secured to the brace uniting the lower extremities of said arms.

IMPROVED DOOR CHECK.

William Cassill, Reed's Mills, O., assignor to himself and James M. Henderson, of same place.—As the door is swung open it strikes against and pushes back a bumper, the rearward movement of which throws a catch forward to grasp the edge of the door and hold it open until released by turning back the said catch.

NEW AGRICULTURAL INVENTIONS.

IMPROVED BARBED METALLIC FENCE.

William H. Gilman, Belvidere, Ill.—This consists of a bar of metal, either flat, flanged, or corrugated, pierced by a series of pairs of holes arranged on a line either at right angles with the bar or diagonally, and provided with pointed wire barbs fixed in the said holes.

IMPROVED WHEEL PLOW.

Edward T. Hunter, Hallsville, Ill.—This is an improved riding attachment for breaking plows, so constructed as to receive any desired kind of plow, to enable the plow to be placed between, or at one side of, the wheels, and may be adjusted to receive a left-hand or a right-hand plow, as may be desired.

IMPROVED CORN PLANTER.

Henry J. Snyder, Adams, Evansport P. O., O.—This machine combines several new mechanical devices which enable it to furrow, drop the seed, cover it, and mark the hills and rows, so that the field may be planted in perfect check row.

IMPROVED FRUIT PICKER.

John C. McEwen, Leesburg, Fla.—In this fruit picker a combination of wires is fastened to a disk, being free at their outer ends to admit the twigs between them. Shears are arranged so that the fruit is allowed to rest in the picker before the stem is excised.

IMPROVED CHECK ROWER.

William L. Black, Virginia, Ill.—This consists of a pair of forked levers attached to a supporting frame, and connected by rods with the seed valve bar of a corn planter. It is operated by a rope having knots or buttons at regular intervals, which passes around a sheave at each end of the supporting frame and through the forks of the levers, and is attached to stakes at each end of the field.

IMPROVED PLOW.

George T. Hedrick, Mill Springs, Ky.—The invention is an improvement in the class of sod or turning plows, and relates, first, to the construction of the stock whereby it is adapted for attachment of right and left shares and moldboards; second, to the construction of said shares and moldboards, whereby they are adapted for said attachment; third, to the employment of a detachable and adjustable L or T head brace for the share; and fourth, to the provision of an adjustable wheel which is so attached to the heel of the plow as to adapt it to be swung under the latter to support it while being drawn or propelled from one place or field to another.

IMPROVED HAY RAKER AND COCKER.

Moses Manlove, Muscoda, Wis.—The object is to collect the hay and deposit it upon the ground in cocks. To an endless moving belt are attached crossbars, which are provided with teeth inclined forward, and by which the hay is taken from the ground, carried up the said elevator to its upper end, and dropped into a box, formed in the rear end of the machine and made of such a size as to contain enough hay for a cock. When enough hay has been collected for a cock, a lever is raised, and the weight of the hay forces the bottom and the door of the box open, and leaves the cock stand upon the ground.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED RAILROAD CROSSING.

Darius Pierce, Tower Hill, Ill.—This is an improved crossing for railroad tracks, on which the main and guard rails may be changed to be worn out entirely on both sides, being rigidly secured in position on a suitable bed plate. The main and guard rails are secured at the ends by corner posts, applied by screw nuts to the bed plate. The concaved base rail of the crossing is retained by the rail sections and the inner recessed corner posts.

IMPROVED CAR COUPLING.

Leonard Fleckenstein, Cresswell, Pa., assignor to himself and Martin Miller, of same place.—This relates to improvements in the automatic car coupling for which letters patent were granted to the same inventor, so that the working of the same is facilitated, it being adjusted for cars of different hight, and always kept in the center to interlock perfectly square on curves. It is an arrangement of spring hooks which couple readily when hung to the required hight, and are applied to the car frame by a swinging plate and cushioned bar with the same degree of flexibility and adjustability as the common drawbars in general use.

IMPROVED COTTON AND HAY PRESS.

William M. Penniston and William H. Penniston, Fox, Mo.—This includes a lever presser, in combination with one side of the pressing case, to press the hoops against the side of the bale to hold them in position while they are secured on the other side; another lever presser, on the other side, to hold the hoops at one end while they are strained and fastened; and a lever contrivance for straining and holding the hooks for securing them.

IMPROVED GOVERNOR FOR STEAM ENGINES.

Robert W. Gardner, Quincy, Ill.—This invention consists of pendulous arms, with inner extension toes, acting on double-link parallelograms connected to the valve rod and regulated by a top set-screw bearing on a top stud of the links. The valve chamber has two steam passages and two disks that are detachably applied to the valve rod, to obtain a uniform flow of steam, the valve rod being guided below the steam passages.

IMPROVED STOP WATCH.

Henri A. Lugrin, New York city.—This consists in a wedge-shaped lever and spring, arranged so that it will, when used, raise the center beveled wheel, and so, throwing it out of gear, will interrupt the connection with the watch train and stop the quarter second and split the quarter-second hands. When the lever is brought back to its former position, the beveled center wheel, with the aid of a small spring, attached to it and pressing against the bridge, is made to gear again with the other beveled wheel, and so with the train of the watch.

IMPROVED FEED WATER HEATER.

John B. Mitten, Peru, Ind.—This consists of a series of chambers formed by longitudinal and lateral partition walls, of which the lateral walls have central openings, so that the water is compelled to pass from one longitudinal series of chambers to the next adjoining one, and so on to the boiler. Bottom plugs of each chamber serve for the purpose of cleaning out the impurities collected on the bottom of the chambers, the water being thus heated and purified in its passage from pump to boiler.

IMPROVED BUNG MACHINE.

Charles Abel, Brooklyn, N. Y.—This is an improved machine for forming bungs with tapering sides and beveled heads, from wooden cylinders of the proper length. In using the machine a bung blank is placed in the holder, which is then moved forward by a cam, bringing the blank between centers. A sliding center is then forced forward, and the holder is drawn back. Cutters are now operated to taper and bevel the bung, and then, with the center, are drawn back by springs, and the complete bung drops. The holder then moves forward with another blank, and so on, the whole operation being automatic, except the single act of placing the blanks, one at a time, in the holder.

IMPROVED MACHINE FOR ROLLING NUT BLANK BARS.

Henry Johnson, Haverstraw, N. Y.—This is a pair of rolls, each one of which is made up of sections that are detachably fixed to the shaft. One section of each roll is conical, and forms the flat of the bar, and another section is chambered out to receive the smaller end of the conical section, and has formed on its side the reverse of the form required in the edge of the rolled bar. By this arrangement the flat of the bar passes through the rolls at an angle with the axis of the rolls between a line parallel with the axis and a line running at right angles thereto.

IMPROVED SNOW PLOW.

Horace Resley, Cumberland, Md.—The improvements consist in the particular construction and arrangement of the scoop with respect to the supplemental plow for removing the crust of snow, in the means for adjusting the scoop, and in the arrangement of cutter blades at the points of the scoop where the divided columns of snow commence, to turn which, blades divide the columns into smaller parallel columns, which permits the more easy deflection of the same to one side.

IMPROVED RAILROAD SWITCH.

Conzac S. Bastright, Lebanon, N. H.—This switch is so constructed that the movable rails may be adjusted into the required position by the wheels of the advancing engine, so that there can be no running off the track from a misplaced switch.

IMPROVED WIND WHEEL.

John J. Kimball, Naperville, Ill.—This improved wind wheel has vertical fans pivoted at the ends in fixed horizontal arms of a vertical revolving shaft, so that they will turn edgewise to the wind, and the wheel will stand at rest. For holding them so as to take the wind sidewise, there is a stop bar extending along one side of each series from the outermost one to the center, where it is connected to a weighted cord hung around the shaft. This draws the bar, and stops the fans sidewise to the wind at one side of the wheel, while they are still free at the other side to turn edgewise, thus enabling the wind to take effect for revolving the wheel. A contrivance for lifting the weights, and thus freeing the fans to the wind on both sides of the wheel, is used for stopping it.

IMPROVED BLOWER.

John M. Cayce, Franklin, Tenn.—The object of the invention is particularly to furnish a blower which shall be capable of being operated with the least possible friction in which the use of valves or other appliances liable to get out of order, and which necessarily add considerably to the cost of the machine, are dispensed with, and which shall be adapted to automatically regulate the amount of air forced through it in a given time. To this end the patentee employs, first, a hollow rotary cylinder having perforated heads, and provided with a series of curved tubular arms attached to its periphery; and second, an air eduction pipe, which forms the hollow axis of the wheel and extends upward within the chamber of the cylinder above the level of the water in which the latter revolves; and thirdly, an expansible, liquid seal air receiver which acts as a governor to regulate the speed of the blower.

IMPROVED CAR AXLE BOX.

Marion Jansen and Josiah Mekeel, Garrison's, N. Y.—The journal box has a door, closed by a spring key. The oil cup has a half-round groove formed upon the lower side of its bottom, to receive and rest upon the journal. In the bottom of the cup are formed a number of small holes, through which the oil escapes to the journal, and in which are placed pins to keep them clear, and facilitate the escape of the oil. To the front side of the cup is secured an open glass tube, the lower end of which is connected with a hole in the cup, so that it can be seen, by simply opening the door, how much oil there may be in the cup.

Notes & Queries

It has been our custom for thirty years past to devote a considerable space to the answering of questions by correspondents; so useful have these labors proved that the SCIENTIFIC AMERICAN office has become the factotum, or headquarters to which everybody sends, who wants special information upon any particular subject. So large is the number of our correspondents, so wide the range of their inquiries, so desirous are we to meet their wants and supply correct information, that we are obliged to employ the constant assistance of a considerable staff of experienced writers, who have the requisite knowledge or access to the latest and best sources of information. For example, questions relating to steam engines, boilers, boats, locomotives, railways, etc., are considered and answered by a professional engineer of distinguished ability and extensive practical experience. Enquiries relating to electricity are answered by one of the most able and prominent practical electricians in this country. Astronomical queries by a practical astronomer. Chemical enquiries by one of our most eminent and experienced professors of chemistry; and so on through all the various departments. In this way we are enabled to answer the thousands of questions and furnish the large mass of information which these correspondence columns present. The large number of questions sent—they pour in upon us from all parts of the world—renders it impossible for us to publish all. The editor selects from the mass those that he thinks most likely to be of general interest to the readers of the SCIENTIFIC AMERICAN. These, with the replies, are printed; the remainder go into the waste basket. Many of the rejected questions are of a primitive or personal nature, which should be answered by mail; in fact hundreds of correspondents desire a special reply by post, but very few of them are thoughtful enough to enclose so much as a postage stamp. We could in many cases send a brief reply by mail if the writer were to enclose a small fee, a dollar or more, according to the nature or importance of the case. When we cannot furnish the information, the money is promptly returned to the sender.

W. H. L. will find descriptions of steam canal boats on pp. 15, 246, vol. 27, and on p. 350, vol. 35.—R. K. will find directions for galvanizing cast iron on p. 346, vol. 31.—J. T. will find directions for renovating worn files on p. 361, vol. 31.—W. D. M. will find a description of a hydrogen lamp on p. 242, vol. 31.—G. S. will find directions for dissolving rubber on p 119, vol. 28.—R. L. W. will find directions for making rubber stamps on p. 155, vol. 31.—A. D. will find directions for making farina (dextrin) from potatoes on p. 315, vol. 30.—J. C. W. will find directions for cleaning shells on p. 122, vol. 27.—L. W., Jr., will find directions for engraving on glass on p. 375, vol. 33.—C. A. H. will find directions for dyeing felt hats black on p. 101, vol. 30.—A. C. will find an explanation of the ball and current of air puzzle on p. 262, vol. 35.—J. W. C. will find directions for condensing milk on p. 343, vol. 30.—M. G. will find directions for drilling glass on p. 218, vol. 31.—W. H. will find the article on the penetrating power of light on p. 180, vol. 33.—F. S. will find a description of infusorial earth on p. 296, vol. 35.—J. McG. will find directions for preserving cider on p. 11, vol. 31.—E. A. D. will find directions for making a magnet helix on p. 220, vol. 35.—F. B. will find directions for utilizing sawdust on p. 276, vol. 32.—H. E. will find a description of the templet odontograph on p. 181, vol. 35.—W. H. D. will find directions for painting theatrical scenery on p. 200, vol. 26.—R. should use black Japan varnish for lettering on marble.—G. S. should consult a dentist.—W. T. B. will find directions for making hard soap on pp. 331, 379, vol. 31. For toilet soaps, see p. 286, vol. 28.—C. F. S. will find directions for purifying cistern water on p. 365, vol. 32.—F. B. will find that the best way to put bronze on paper is to draw the design in gold size, and dust on the bronze.—A. D. will find a good recipe for a white metal on p. 139, vol. 31.—W. J. E., M. F. B., F.N.P., W. G., W. F. H., R. J. B., G. S., and others who ask us to recommend books on industrial and scientific subjects, should address the booksellers who advertise in our columns, all of whom are trustworthy firms, for catalogues.

(1) D. Z. asks: How can I separate chloride of silver from sand? A. Dissolve in ammonia water, and reprecipitate the solution by the addition of an acid, or evaporate to dryness.

(2) M. G. says: I have about 35 gallons of Rhine wine which seems about to sour. How can I reclaim it? A. Heat a test portion to near the boiling point, add a little carbonate of iron, agitate briskly for a few moments, and filter. If this does not succeed, try a small quantity of lime water. Let us know how these succeed. Foul or sour wines are usually corrected by digestion with a little chalk or the white carbonate obtained from calcined oyster shells, also by agitation and digestion with charcoal or boneblack, and subsequent filtration or decantation. Salicylic acid has lately been employed to cure the rancidity or foulness of wines, and to check fermentation. In Germany varying quantities of grape sugar is added to some wines. 2. Do wines and liquors draw any copper from brass faucets? A. Many wines do exert a more or less solvent action upon copper, owing to the free acids which they contain. 3. How is H_2S most conveniently prepared? A. It is obtained by the action of diluted sulphuric acid on monosulphide of iron. The gas is ordinarily dissolved in cold distilled water as it comes over.

What fulminate is used in pistol cartridges, and how is it put in? A. We believe the mercury fulminate is generally employed. Percussion mixtures, of chlorate of potash, sulphide of antimony, sulphur, and gunpowder, and chlorate of potassa and amorphous phosphorus, are used to a limited extent.

(3) D. W. asks: How many lbs. pressure will it require to break a cast iron beam in the center supported at each end? The beam is 36 inches long, 13 inches deep, and 1 inch thick. A. About 100,000 lbs.

(4) C. E. E. says: I have a pleasure boat propelled by an engine 6 inches in diameter by 8 inches stroke, which makes 200 revolutions per minute, using steam at 100 lbs. pressure in the boiler, cut off at one half stroke. I wish to attach a surface condenser to it; please inform me of what size it should be, etc.? A Make the condenser with from ⅝ to ¾ as much cooling surface as your boiler has heating surface. Use small tubes, quite thin, full particulars of which you can obtain from a manufacturer. If you only wish to condense the steam to use as feed water, you can discharge it into a pipe immersed in the water, and use a small air pump. By this arrangement, which is in use on several small steamers, you do not require a circulating pump.

(5) A. M. asks: If I have a cylinder of 2 inches bore, with an airtight piston in it, how much pressure do I get by compressing the air into any fractional part of the cylinder? A. If the temperature of the air is kept the same, the pressure varies inversely as the volume. For the case in which there is no gain or loss of heat, see answer No. 28, October 7, 1876.

(6) J. F. asks: How can I make a paste or paint for marking flour sacks? A. The aniline colors are perhaps the best materials you could use for the purpose. There are, of course, many other marking fluids that might give proper satisfaction as to application, durability, etc.; but they are al more or less difficult to extract from the fabric after application. The aniline colors may be removed completely and with facility by the addition to the washing water of a small percentage of spirit of wine or wood spirit.

(7) E. M. C. says: By what process can I soften plaster of Paris which fastens the brass burners to lamps? A. Use plenty of water and mechanical exertion.

(8) F. A. H. says: I have seen the idea advanced of lubricating sewing machines and other light machinery with glycerin. What do you think of it? A. It has been used, we believe, with very good results. Dilute it with water.

1. What is the difference between writing ink and writing fluid? A. In ordinary ink the iron salts and other ingredients are merely in mechanical mixture, being prevented from settling to the bottom by the addition of gums, etc. In the writing fluids, so-called, the ingredients are all in true solution. 2. What is copying ink? A. Copying inks contain sugar; in other respects they differ but little from ordinary inks.

(9) A. M. asks: 1. How can faded silver-plated ware be restored? A. Have it replated. This is the cheapest and best method. 2. I have tried mercury dissolved in nitric acid, applied with a cotton rag; and though this solution gives a splendid appearance, yet it does not stick long. Is it hurtful to use spoons or forks thus silvered? A. The mercury is very poisonous.

(10) E. A. asks: Can you give your readers any more details concerning the recipe in your No. 17, vol. 30, for making compressed yeast? A. The precise mode of preparing this ferment is more or less a trade secret. Make the mash in the ordinary way, of 1 part of bruised barley malt with 3 parts of bruised rye, the mash being cooled with the fluid portion of the wash. Add sufficient yeast to start a brisk fermentation, gather the newly formed yeast as it rises to the surface, wash well with water, and place in a stout canvas bag under a press, by which means it may be obtained as a stiff clayey dough. It is better to mix the yeast with from 10 to 20 per cent of potato starch. Many of your questions you can best answer for yourself, by experiment.

(11) T. R. A. asks: 1. What substance is the worst conductor of heat? A. The poorest heat conductors are found among organic substances: feathers, cotton, wool, straw, bran, wood, etc. 2. How may it be formed into a paste, to be baked and glazed as pottery ware is done? A. This is impracticable.

(12) T. A. J. asks: How can I collect mercury after it has been dissolved with nitric acid and diluted with water? A. Precipitate the mercury as oxide by the addition in excess of a strong solution of caustic potash or soda (caustic alkali), decant the supernatant liquid, dry the precipitate, place it in an iron retort, the beak of which or its connection just dips below the surface of cold water in a suitable vessel, and heat the retort strongly over a good coal fire until the pure mercury is all distilled over. It is advisable to wash the precipitated oxide of mercury well with water before drying it, previously to placing it in the retort.

How can I make a good carbon battery that will be strong and cheap? A. Place a suitable porous cup of unglazed porcelain in a glass or earthenware jar, and surround it with a thick piece of zinc. Fill the outer jar to within about 2 inches of the top of the porous cup with water, to which add about 2 ozs. of strong oil of vitriol. Place the plate of carbon in the porous cell, and surround it with a solution made as follows: In a pint of water dissolve 1 oz. of bichromate of potash, and add to this 2 ozs. of strong oil of vitriol; allow to cool before using. If the end of a copper wire of any length be connected, one with the carbon and the other with the zinc, the current will run through it from the carbon end to the zinc.

(13) H. G. W. asks: Why is it that, if we make a small hole through a piece of paper and hold it up before the eye at a distance of about 1 inch, and pass a needle down over the hole on the side next to the eye, the light appears to be cut off from the bottom first? A. As the images of all objects are inverted in the eye, when any object goes down, the image in the eye goes up; and as the rays of light cross in passing through small holes, the going down on one side is equivalent to going up on the other.

(14) I. G. O. asks: What is the best method to extract the oil from belts that have got saturated therewith? A. Wash with soap and warm water.

(15) E. F. asks: What acid can I use to clean dirty, already used benzine, to fit it for use again? A. It is easiest purified by distillation.

(16) W. J. says: I notice that the connecting rods of most of the small American engines are connected with their straps by means of bolts and one key. What advantage is there in using these bolts? Is not the gib and key just as good? A. If a connecting rod strap is held to the rod by a gib and key, the brasses must meet at the joint so that the key can be driven tightly home, thus locking the strap. If the joint of the brasses is left open so that driving in the key will take up the wear without having to file off any of the face of the brasses at the joint, the key in no way acts to lock the strap at all. If the strap is locked to the strap by bolts, it is no matter whether the joint faces of the brasses are left open or not; the strap will always be held securely in position, and its wear will be considerably less. The bolts hold the straps more securely and enable us to keep the length of the rod as nearly correct as possible by putting the key at one end inside and at the other end outside of the brasses, as shown on p. 490, vol. 2, of the SCIENTIFIC AMERICAN SUPPLEMENT.

(17) S. L. S. says: Does the use of coal oil on a mechanic's oilstone harden or soften it? A. It hardens stones of most kinds.

(18) S. N. M. asks: Is there not an error in the numbers given on p. 155, vol. 35, under title of "New Arrangement of the Spectroscope?" A. We have addressed Professor Young on the subject, and his reply is as follows: "The numbers are both given wrong. Calculation assigns for the velocity of the sun's surface 1·246 miles per second. My observed velocity deduced from spectroscopic observations was 1·42 miles. At Buffalo I gave the number as 1·36, but I had neglected to apply a correction for the latitude of the point on the sun's limb at which the observation was taken, and this made a little more difference than I expected."

(19) C. S. asks: What metal or combination of metals would be best suited to take a sharp cast? The metal commonly used to take casts from paper molds scorches the paper, and I want something that melts at a much less temperature. A. Try the following fusible alloy, which fuses below the boiling point of water, at 201° Fah: Two parts of bismuth, one of lead, and one of tin.

(20) B. M. R. asks: When two shadows are brought near to each other, why do they seem to protrude toward each other and touch? A. The edges of shadows are not sharp, and when they are brought near together the edges overlap and become visible. When single, they were not visible.

How does thunder turn milk sour? A. It is done by the electricity in the atmosphere, which will coagulate the albumen in the milk; and it renders the sensitised gelatin, used in the carbon photo process, insoluble.

Do the trees of Australia turn their leaves edgeways to the sun? A. There are some instances in which they do, but not generally. The native trees are all evergreens. Some shed their bark and not their leaves. There are in Australia plums with the stones on the outside. There does not appear to be any general law governing the growth of vegetation there.

What is the cause of equinoctial storms? A. Observations extending over a large number of years show that we have more storms when the sun crosses the equator than at any other time.

What people of ancient Greece spoke the language now called Greek? A. None.

(21) H. S. G. asks: Do you know of any acids or any process that will eat off common solder from a gold watch case? A. If the solder is what you say, strong nitric acid will remove it without injury to gold; but before you try the experiment, be sure that the watch case is of gold.

(22) C. A. W. says: I am building a rustic fence of cedar poles, keeping the bark on; but I find that after a time the bark begins to fall off, which of course disfigures it very much. Is there anything in the way of a varnish, etc., which would prevent this? A. The usual course is to remove the bark in the first place as neatly as possible, so as to preserve the smooth surface of the cedar intact. With a little care, this can still be done with your fence, and will save you further trouble in this respect.

(23) D. H. says: I am wearing a plaster with one zinc and one copper plate connected by a wire. Will the verdigris which is formed, the skin being in contact with the copper, produce injurious effects? A. Possibly not verdigris, but other copper salts may be formed that are as objectionable and injurious.

(24) A. F. T. asks: 1. How can I dispel the bad odor arising from a damp wall indoors? A. If the wall is now papered, the bad odor may arise from the decay of the paper and paste. Strip off the paper and wash out the paste, etc. 2. How could this wall be best repaired, so that wall paper would stick and would not become discolored? The dampness was caused by water escaping into the cellar, which has since been filled up with yel-

low clay, the dampness and bad odor only became apparent some five years after the filling in. A. Place vertical furring strips on the wall 12 inches apart, and lath and plaster it anew. 3. Could the dampness of the wall have been caused by grass growing alongside the wall on the outside? A. We think not. The dampness most probably comes up from the bottom of the wall by capillary attraction.

(25) A. C. asks: How can I make a steam siphon pump to raise water about 8 feet, using nothing but pipes and fittings? A. Such pumps, as ordinarily constructed, require nozzles of a peculiar form, and we scarcely think that you can accomplish the same object with common pipe fittings.

(26) H. & S. ask: 1. Do the journals of the crank shaft of an engine support the whole weight of the flywheel, or is it partly taken off by the centrifugal force? A. The whole weight of the wheel is in running balance. If it is unbalanced the centrifugal force will take off weight at one part of the stroke, and increase it at the other. 2. Our flywheel is 9 feet in diameter, with a rim 4 x 5 inches, which weighs 1,500 lbs. It is made in 12 segments, and bolted on 6 wooden arms 3½ x 5½ inches, made secure in a center by 12 bolts. Are we safe in running her at 100 revolutions? Size of engine is 10 x 20 inches, crank shaft 5 inches in diameter. A. Yes, if the wheel be well built.

(27) T. A. H. asks: What is diastase? A. During the germination of seeds, the starch undergoes a species of fermentation and is converted into a mixture of dextrin and sugar, in which state it is assimilated by the young shoots. This conversion is due to the action of the peculiar ferment termed diastase, which exists in all germinating seeds during the act of growth, being probably merely albumen or gluten in a peculiar stage of decomposition. An impure solution of diastase may be obtained readily from malt or freshly germinated barley by grinding it, moistening it with half its weight of warm water, allowing it to stand for a few minutes, and pressing out the liquid. Malt does not contain more than $\frac{1}{500}$th of its weight of diastase. Diastase is not a commercial article.

(28) E. W. M. says: 1. Can you inform me through your valuable paper how an artesian well is sunk? A. Sometimes a drill like an auger is used. In rock, a drill is necessary. 2. Are drive pipes sunk in the same way as artesian wells? A. In the driven well, a tube is sunk as fast as the hole is bored. 3. How do you ascertain when you have struck water? A. The presence of water can be ascertained by sounding, or by the aid of a small pump. It is by no means certain that an artesian well can be struck in any locality simply by boring.

(29) A. W. G. asks: Can you tell me what will render horn transparent, or nearly so, and sufficiently soft to be cut with a knife? It must harden again when dry. A. Try muriatic acid.

(30) G. H. asks: 1. I wish to bring water from a spring 3,000 feet distant. There is a fall of 15 feet, and there will be a head of 2 feet where the water enters the pipe. What quantity per day would be conveyed through a pipe 1 inch in diameter, and to what hight would the water be thrown at the lower end? A. The hight to which the water will rise at the discharge end of the pipe will depend upon the velocity. According to Weisbach's formula, if the pipe is straight and smooth, you can raise the water about 14 feet for a discharge of $\frac{7}{10}$ of a U. S. gallon per minute, or you can discharge about 2¼ gallons per minute at the lower level of the pipe. 2. Will iron gas pipe answer? A. Yes.

(31) J. E. D. asks: How high will water rise from a ½ inch or ¼ inch jet if brought 1,200 feet in 1 inch pipe, with a fall of 18 feet? How many gallons per hour would flow through said jets? A. With a well shaped discharge jet, ¼ inch in diameter, you can probably throw a stream from 10 to 12 feet high, and discharge about 60 U. S. gallons per hour.

(32) S. D. P. Jr. says: Is it a settled fact that our best turbines yield a greater percentage of power from the same amount of water than overshot wheels of the best construction, especially where the stream is variable? A. In the case of a variable stream, experiments seem to show that there is an advantage gained by using a good turbine. When the head and discharge are constant, the principal advantages of turbines over overshot wheels consist in less weight and greater velocity, so that less gearing is ordinarily required.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

G. A. C.—It is fool's gold (sulphide of iron).—H. M.—The scales are common potash mica. They are mixed up with sand and a little felspar.—J. K., Cal.—It is sulphate of lime.—J. K., Texas.—It is soda.—C. E.—It is diorite.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Steamships, Rigging, etc. By R. B. F.
On Naval Appointments. By C. J. W.
On Solar Phenomena. By C. T. G.
On an Intra-Mercurial Planet. By W. M. R.

Also inquiries and answers from the following:

T. D.—R. W.—J. B.—G. M.—G. H.—D. L.—W. B.—G. J. D.—R. A.—S. O.—N. S. R.—C. S. P. F.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who buys rabbit, raccoon, and musk rat skins? Who sells velocipedes? Who sells street car locomotives? Who makes match machinery? Who sells distilling apparatus?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

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FOR WHICH

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October 10, 1876,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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